

THIS MEMO

PERTAINS TO #
DOCS. # 5421, 5422
+ # 5423

MEMORANDUM

August 21, 1991

TO: BOSTON REDEVELOPMENT AUTHORITY AND
STEPHEN COYLE, DIRECTOR

FROM: PAUL BARRETT, ASSISTANT DIRECTOR
VICTOR KAREN, DEPUTY DIRECTOR
DON KLABIN, SENIOR PROJECT MANAGER
HARBOR PLANNING AND DEVELOPMENT
KAREN GRAY, SENIOR PLANNER
RICHARD MERTENS, ENVIRONMENTAL REVIEW OFFICER

SUBJECT: SECTION 61 FINDINGS REGARDING: BUILDING A OF THE PROPOSED
BIOMEDICAL RESEARCH CENTER AT PARCEL 7, THE PROPOSED HOTEL
ON PARCEL 4 AND THE MARINA ON PIER 9.

SUMMARY: THIS MEMORANDUM REQUESTS ADOPTION OF SECTION 61 FINDINGS AND AUTHORIZATION TO FILE THE SECTION 61 FINDINGS REGARDING BUILDING A OF THE PROPOSED BIOMEDICAL RESEARCH CENTER AT PARCEL 7 IN THE CHARLESTOWN NAVY YARD; THE PROPOSED HOTEL ON PARCEL 4; AND THE PROPOSED MARINA ON PIER 9. THE PREPARATION OF THESE FINDINGS WAS REQUESTED IN THE DECISION OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS DATED JANUARY 2, 1991 REGARDING THE NOTICE OF PROJECT CHANGE DATED OCTOBER 31, 1990.

On October 11, 1990, the Boston Redevelopment Authority ("BRA") voted to adopt the Charlestown Navy Yard Master Plan. Subsequently, a Notice of Project Change ("NPC") was submitted to the Commonwealth of Massachusetts Executive Office of Environmental Affairs ("EOEA") describing the changes proposed by the Master Plan dated October 1990 from prior State approvals pursuant to the Massachusetts Environmental Policy Act ("MEPA").

In response to the NPC, EOEA requested that the BRA submit a Section 61 Finding ("Finding") describing the following five (5) environmental impacts on Building A of the proposed Biomedical Research Center to be built at Parcel 7 in the Yard's End area of the Charlestown Navy Yard: wind, shadow, height, massing, and public accessibility. EOEA also requested that the BRA submit the Pier 9 site plan, and circulate it to parties who commented on the Notice of Project Change. Lastly, EOEA requested that the BRA prepare a Section 61 Finding, describing the following environmental impacts of the proposed hotel on Parcel 4: wind, shadow, and other conditions of the ground level pedestrian environment, including visual access considerations.

Building A

In summary, the finding indicates that there are only minor adverse impacts in each of the five categories listed above, and that all feasible mitigation measures have been taken by the BRA to avoid or minimize the environmental impacts associated with the development of Building A at Parcel 7.

The filing of the Finding with the Commonwealth of Massachusetts at this time would complete the MEPA review of the Building A project at Parcel 7 and, thereby, expedite the start of construction. Accordingly, it is requested that the BRA adopt the attached Finding and authorize the Director to submit the Section Findings regarding Building A at Parcel 7 to EOEA pursuant to the MEPA regulations.

Pier 9 Marina

The Pier 9 Marina project consists of the development of a private marina containing up to 150 marina slips, together with accessory marina uses which may be constructed on the remaining portions of Pier 9 in the Charlestown Navy Yard, and up to 12,000 square feet of restaurant, yacht club, and accessory uses on adjacent Pier 8. Pursuant to the Harborpark District (Charlestown) Zoning and the Boston Municipal Harbor Plan, the maximum allowed building height of any accessory marina use shall be 35 feet. The environmental impacts of the development of the Pier 9 Marina have been evaluated in the Final Environmental Impact Report for the proposed Charlestown Navy Yard Development, dated January 31, 1977.

Therefore, it is also requested that, with respect to the Pier 9 Marina, the attached Finding that all feasible mitigation measures have been taken by the BRA to avoid or minimize environmental impacts be adopted. In accordance with the Secretary's decision a detailed site plan of the marina will be submitted and circulated to those who have commented on the NPC.

Parcel 4 Hotel

Wind and shadow studies which include the Parcel 4 Hotel have been conducted for submission in the Final Supplemental Environmental Impact Report (FSEIR) for the Charlestown Navy Yard. These studies indicate minimal adverse impacts on the ground level pedestrian environment, and that all feasible mitigation measures have been taken by the BRA to avoid or minimize these environmental impacts associated with the project.

As other conditions of the ground level pedestrian environment, including visual access considerations, study indicates that all feasible mitigation measures have been taken by the BRA to avoid or minimize harm to the environment. The design of the hotel has been modified in consultation with the Massachusetts Historical Commission, the Boston Landmarks Commission, and the Advisory Council on Historic Preservation. This process has resulted in the massing of the building originally approved by the Secretary in a "dumbbell" shape, being moved to the northern side of the site.

In addition, thirty townhouse condominiums originally approved for the water's edge have been deleted from the Parcel 4 plan. This deletion results in a continuous Harborwalk, improving both physical and visual access to the waterfront. Through deletion of the townhouses, privatization of this portion of the waterfront is avoided.

Accordingly, it is requested that the BRA adopt the attached Finding regarding the Parcel 4 hotel and authorize the Director to submit the Section 61 Finding regarding the Hotel at Parcel 4 to EOEA pursuant to the MEPA regulations.

Appropriate votes follows:

VOTED: That the Authority hereby adopts the attached Finding entitled "M.G.L. Chapter 30, Section 61 Finding on Building A of the Biomedical Research Center, Charlestown Navy Yard Redevelopment," and authorizes the Director to submit the Finding to the Commonwealth of Massachusetts Executive Office of Environmental Affairs; and #5421

FURTHER
VOTED: That the Authority hereby adopts the attached Finding entitled "M.G.L. Chapter 30, Section 61 Finding on Parcel 4 Hotel, Charlestown Navy Yard Redevelopment," and authorizes the Director to submit the Finding to the Commonwealth of Massachusetts Executive Office of Environmental Affairs; and #5422

FURTHER
VOTED: That the Authority hereby adopts the attached Finding entitled "M.G.L. Chapter 30, Section 61 Finding on Pier 9 Marina, Charlestown Navy Yard Redevelopment," and authorizes the Director to submit a detailed site plan of the marina to the Commonwealth of Massachusetts Executive Office of Environmental Affairs. #5423

Figure 1 Site Identification Map



DOC. # 5421
ADOPTED
8/21/91

**M.G.L. CHAPTER 30, SECTION 61 FINDING
ON BUILDING A OF THE BIOMEDICAL RESEARCH CENTER,
CHARLESTOWN NAVY YARD REDEVELOPMENT**

By the Boston Redevelopment Authority

August 21, 1991

The Boston Redevelopment Authority (BRA) is filing this Section 61 Finding relating to Building A, which is also referred to as Building 1, on Parcel 7. The Executive Office of Environmental Affairs has approved a building containing approximately 300,000 square feet of space, and limited in height to 140 feet in accordance with the Design Guidelines approved by the Massachusetts Historical Commission. The Finding is made with the Secretary of Environmental Affairs in accordance with the Massachusetts Environmental Policy Act (MEPA) (M.G.L. Chapter 30, Section 61) and its implementing regulations (310 CMR 11.10 (3)) and in accordance with the January 2, 1991, Certificate of the Secretary.

This document contains a discussion of the purpose of the Section 61 Finding, the scope of the Finding, the environmental impacts created by the project, the measures the BRA will take to avoid or minimize those impacts, and the BRA's Section 61 Finding.

The Purpose of the Section 61 Finding

Pursuant to 301 C.M.R. 11.10 (3), any agency which acts on a project for which a Section 61 finding is required "must determine the impact on the environment of such projects, make a finding describing such impact, if any, and make a finding that all feasible measures have been taken to avoid or minimize the impact."

Scope of the Section 61 Finding

The MEPA process for the redevelopment has been scoped to include all environmental impacts. As discussed below, in his decision of January 2, 1991 on the Notice of Project Change for the Charlestown Navy Yard redevelopment, the Secretary of Environmental Affairs directed that five specific issues be addressed in the Section 61 Finding on Building A of the Biomedical Research Center: wind, shadow, height, massing, and public accessibility. Accordingly, the focus of this Section 61 Finding is on the five issues identified by the Secretary. However, a general finding is also made.

MEPA History

On January 31, 1977, the BRA submitted a Final Environmental Impact Report (FEIR) for the proposed Charlestown Navy Yard Redevelopment to the Executive Office of Environmental Affairs (EOEA). In response to comments by the Secretary of EOEA, dated March 1, 1977,

the BRA submitted an Addendum to the FEIR, dated January 1978. On February 19, 1978, the Secretary issued a certificate approving the FEIR.

On October 31, 1990, the BRA filed a Notice of Project Change (NPC) respecting changes in the proposed redevelopment program. In that NPC, the BRA requested the Secretary:

1. to determine that Building A of the proposed Biomedical Research Center, the hotel, and the Pier 9 marina require no further MEPA review;
2. to determine that issues of traffic, air quality, infrastructure, historic preservation, and waterways have been adequately studied with respect to the new development plan; and
3. to provide scoping information, if necessary, for the remainder of the Biomedical Research Center and Aquarium.

In his response dated January 2, 1991, the Secretary determined that Building A and the hotel would not require the submission of a supplemental environmental impact report. However, in anticipation of conditions contained in the Secretary's later decision, dated May 22, 1991, on Boston's Municipal Harbor Plan, the Secretary required the filing of a Section 61 Finding addressing issues related to Chapter 91 of the General Laws. The Secretary stated:

Building 1 [A] will have to demonstrate compliance with the new Chapter 91 regulations and Boston Municipal Harbor Plan. Issues of height, massing, shadow and wind impacts, and public accessibility are being addressed in the Municipal Harbor Plan and should be described in a Section 61 Finding to be filed with the Secretary prior to issuance of the Chapter 91 license. While this type of information could be provided in Supplemental EIR, I am comfortable not requiring such a report provided that the building adheres to the MHC's height limit and the other parameters set forth in this letter and that the proponent works with the BRA, DEP and CZM to address the impacts and public accessibility concerns I have identified above.

The Secretary deferred determinations on the second and third requests pending submission, respectively, of (i) the revised Master Plan, to be treated as a Draft Supplemental Environmental Impact Report (DSEIR) and (ii) Environmental Notification Forms (ENFs) for Buildings 2 [B] and 3 [C] of the Biomedical Research Center and the Aquarium. The Secretary approved the Municipal Harbor Plan on May 22, 1991 and the development of Building A is consistent with that approval.

Environmental Impacts Caused by the Project

The Secretary has identified five impact areas to be the focus of this Section 61 Finding. They are wind, shadow, height, massing, and public access.

Wind -

For the most part, Boston's weather is dominated by three different wind directions: northwest (winter), southwest (summer), and easterly (storm) winds. As explained in detail in a pedestrian level wind study undertaken by Frank H. Durgin, PE, which is presented in Appendix A, the impacts to these three prevailing wind patterns caused by the Navy Yard redevelopment, and specifically Building A, are as follows:

Northwest (winter) Winds - The addition of Building A to the site will have little or no effect on the winds at the southwest end of Building 199 or the Harborwalk, except in the lee of Building A where the winds will be reduced. It will cause an increase in the winds along Sixteenth Street between Building 199 and Building A for northwest winds, but the effect will be much less than one would normally expect.

Southwest (summer) Winds - The construction of Building A will have little or no effect on the winds near the Rowhouses or at the west end of Building 199. Normally, one would expect it to reverse the southeast winds in Sixteenth Street, but with both Buildings 199 and 149, which are of similar height and upstream of Building A, those winds will be reduced, but not reversed. Also, the expected accelerated winds near the pedestrian entrance in the southeast wall of Building A will be much reduced for the same reason. Building A also will provide sheltering for the Harborwalk that is to the northeast of it.

Easterly (storm) Winds - The addition of Building A will shield the north and east corners of Building 199, reducing winds there.

For northeast and east winds, the pedestrian entrance to Building A just north of the vehicular entrance on Sixteenth Street will be shielded from the wind. On the other hand, the entrance at the southeast end of the building will see highly accelerated flow. This will not be true when the rest of the Biomedical Center is completed, since then it will be shielded by the other buildings in the complex. Mitigation measures described in the following section will adequately ameliorate this condition.

For northeast winds, Building A will shield Buildings 199 and 149 and thus reduce any current windiness at their main entrances, but, for easterly winds interim mitigation measures will be undertaken in the form of landscaping improvements. Again, building the rest of the Biomedical Research Center and the Aquarium will help reduce the east and southeast winds, respectively.

Shadows -

The Charlestown Navy Yard redevelopment, and specifically Building A, will have minimal negative shadow impacts on proposed active pedestrian open space areas. A shadow analysis undertaken by Sasaki Associates, Inc. and presented in Appendix B indicates that there are areas where some net new shadow will be cast from Building A.

Shadows were projected for Building A on four key days of the year (March 21, June 21, September 21, and December 21) to establish a representative view of shadow impacts through the four seasons. Morning (9 AM), noon (12 PM), and afternoon (3 PM) shadows were calculated in order to understand the movement of shadows throughout each key day.

Entry Plaza - The northern portion of the entry plaza area serving Biomedical Research Center Phases B and C will be in partial shadow by early to mid-afternoon for all four seasons studied. However, the most extensive shadow cast on this area will be during the summer afternoons when the shading caused by Building A could be very desirable.

Sixteenth Street - Building A will cast shadows on Sixteenth Street in the early morning during March, June, and September. However, no shadows will be cast in this area in the winter.

Harborwalk - Building A will cast shadows on very short (50-75 feet) lengths of the Harborwalk along the Little Mystic Channel between noon and 3:00 pm in September and on moderately larger (75-250 feet) lengths of the Harborwalk at 9:00 am, noon, and 3:00 pm in March and December. These shadows move along the Harborwalk from the very end of the walk at Building 114 in the morning to the eastern edge of Parcel 7 in the late afternoon. It should be noted, however, that Harborwalk along the Little Mystic Channel is a new addition to the Charlestown Navy Yard redevelopment plan and was not envisioned in 1978.

Height - Adherence to MHC Height Limit and Municipal Harbor Plan

The maximum building height in the Charlestown Navy Yard redevelopment will be 155 feet. Building A will be 140 feet tall and consistent with the Boston Zoning Code and the Municipal Harbor Plan. This height adheres to the height limits agreed to by the Massachusetts State Historic Preservation Officer (MSHPO), the Advisory Council on Historic Preservation (ACHP), and the Boston Redevelopment Authority in revised design guidelines for the Navy Yard (see Appendix C). (Please note that Building A is referred to as Building 1 on Parcel 7 in the revised design guidelines. Accordingly, the height of Building A is also consistent with the Municipal Harbor Plan proposed for the Charlestown Navy Yard by the BRA.)

Massing -

Building A will be 140 feet in height, approximately 120 in width, and will extend approximately 270 feet in length along Sixteenth Street and 320 feet in length along its northeast side. Located in the northeasternmost area of the Navy Yard, where the tallest and more massive existing buildings are situated, Building A will have a massing that will be compatible with these early twentieth-century warehouse buildings, particularly Building 149 (96/118 feet in height) and Building 199 (110 feet in height). In addition, Building A will maintain the existing street wall along Sixteenth Street,

characteristic of the Navy Yard development as a whole, and will reinforce the Yard's street pattern, in conformance with the Urban Design Guidelines of the City's recently-approved Municipal Harbor Plan.

Public Accessibility -

Building A of the Biomedical Research Center does not adversely impact public accessibility to or from the waterfront, or the flow of pedestrian traffic within the Navy Yard itself. Building A contributes many public passageways and spaces that both welcome and encourage pedestrian activity.

Mitigation Measures to be Taken by the BRA

The BRA proposes the following mitigation measures to avoid or minimize the minimal environmental impacts associated with the construction of Building A.

Wind -

The wind assessment indicates that, while there are expected to be some minor increases in windiness near Building A for both northwest (winter) and southwest (summer) winds when the building is constructed, no seriously windy areas will be caused by the addition of this building. On the other hand, easterly (storm) winds are projected to cause windiness at the main entrance of Building A, and possibly may increase the current windiness at the existing main entrances to Buildings 149 and 199. Both of these windy areas, however, will be mitigated by the completion of the rest of the Biomedical Research Center and the New England Aquarium. Until these other planned buildings are completed, however, the BRA will insure that appropriate temporary wind breaks, such as trees, shrubbery plantings, or architectural wind screens, are installed to reduce the potentially excessive wind velocities at the pedestrian level.

Shadows -

The concentration of new development at the northeastern end of the Navy Yard causes shadows generally to be cast away from the public areas and toward the Little Mystic Channel and the maritime industrial area beyond. This configuration of the buildings reduces shadow impact in the Navy Yard and enhances sunlight in areas of greatest pedestrian activity.

Net new shadows cast by Building A have a minimal adverse impact on high activity pedestrian areas in the vicinity of the site. Building A will have no adverse shadow impact on Yard's End Park, or the First Avenue and Second Avenue corridor. Building A will have some shadow impact on the Harborwalk along the Little Mystic Channel. However, the major shadow impacts on the Harborwalk will occur during the winter months when there would be very little use of this walkway. In addition, the reduction in height of this building from the original proposal of 155 feet to 140 feet, as a result

of review with the Massachusetts Historical Commission, has further mitigated the shadow impacts of Building A on the Harborwalk.

Height - Adherence to New Development Area Design Guidelines

The height of Building A is compatible with those of the nearby early twentieth-century Navy Yard warehouse buildings and adheres to MHC height limits for the New Development Area, as indicated in the attached, revised Design Guidelines for the New Development Area executed by MSHPO, the BRA, and the Advisory Council on Historic Preservation. As a result of design review with the Massachusetts Historical Commission, the height of Building A was reduced from the 155 feet originally proposed, to 140 feet, to be more compatible with the historic character of the Navy Yard.

Massing -

As presently designed, the proposed new Biomedical Research Center Building A has been massed and sculpted so as to reduce adverse ground level impacts and to minimize shading of nearby public open spaces and Harborwalk.

Building A, part of the phased Biomedical Research Center on Parcels 6 and 7, is sited on Parcel 7 so as to permit a large Yard's End Plaza to be formed by the entrances to the Aquarium and the Biomedical Research Center. The rooftop mechanical equipment will not be enclosed, but rather will be treated as discrete elements maintaining the industrial architectural vocabulary of the Navy Yard. By providing the plaza and breaking up the mechanical volume, the massing of the building is mitigated.

Similarly, the street level massing of Building A is less dominant than the massing of the existing neighboring buildings. While Building A has a streetwall length of 270 feet along 16th Street and 320 feet along its northeast side, Buildings 199 and 149 have much longer streetwall lengths of 400 feet and 450 feet, respectively. Likewise, Buildings 199 and 149 have widths of 170 feet and 190 feet, while Building A is significantly less deep with a width of 120 feet.

Public Accessibility -

While Building A does not negatively impact public access within the Navy Yard, it does contribute many public passageways and spaces that both welcome and encourage pedestrian access. Pedestrian passageways will provide inviting access through and around Building A. Building A is adjacent to the Yard's End Plaza, a new public open space designed to enhance the accessibility of Yard's End. An integral part of the Biomedical Research Center, Yard's End Plaza will provide important open space and accessibility to the waterfront that was lacking in the original plan described in the 1978 FEIR.

Section 61 Finding

The BRA has carefully considered these five areas of environmental impact and identified all feasible means and measures for avoiding or minimizing these impacts. Mitigation measures will help to ensure that the public's right to waterfront access will be enhanced, and that sunlight and other important environmental resources in the project area will be protected.

Other environmental impacts have been adequately evaluated in previous MEPA filings, as determined by the Secretary in his decision of January 2, 1991.

Therefore, pursuant to M.G.L. Ch. 30, Section 61, it is hereby found and determined that the proposed development of Building A of the Biomedical Research Center at Parcel 7 of the Charlestown Navy Yard will not result in significant damage to the environment and, further, that all feasible means and measures for avoiding or minimizing adverse environmental impacts have been or will be taken.

BOSTON REDEVELOPMENT AUTHORITY

By: _____

Date: _____

An Assessment of Pedestrian Level Winds for the Proposed
Building A of the Terminal Southside Center in
the Charlestown Navy Yard, Boston, Massachusetts

APPENDIX A

August 23, 1994

AN ASSESSMENT OF PEDESTRIAN LEVEL WINDS FOR THE PROPOSED BUILDING A

For

Frank J. Durgin, P.E.

Prepared for

Boston Redevelopment Authority

August 20, 1991

Frank H. Durgin, P.E.

Prepared for:

Boston Redevelopment Authority

**An Assessment of Pedestrian Level Winds for the Proposed
Building A of The Biomedical Research Center in
The Charlestown Navy Yard, Boston, Massachusetts**

Frank H. Durgin, P.E.

1. INTRODUCTION

1.1 Basis

This evaluation of pedestrian level winds was performed at the request of Mr. Jonathan Warner of Sasaki Associates, Inc. It is based on:

1) The drawings listed below received from Jonathan Warner:

- a) Charlestown Navy Yard Master Plan dated June 1991;
 - b) A similar drawing (unnamed and no date) with isometrics of buildings at an interim stage;
 - c) Three drawings, containing N, E, S, and W elevations and transverse and longitudinal sections of the new New England Aquarium, dated Nov. 1989;
 - d) The Boston Navy Yard - Charlestown, Land Parcel Plan Alternate 2, prepared by Parsons, Brinkerhoff, Quade, & Douglas, dated Nov. 5, 1976;
 - e) City of Boston Topographic and Planimetric Map No. 19N-13E, revised 1988;
 - f) Map giving Existing Building Heights for the Charlestown Navy Yard (no date);
 - g) Elevations and Plan views for Buildings 75, 105, 106, 114, 199, 266, and for the Rowhouses on Thirteenth Street (Various dates and sources);
 - h) Section, Ground Floor Plan, and Atrium Floor Plan for Phases A, B, and C of the Biomedical Research Center dated May 21, 1991 and annotated by Don Klabin, July 10, 1991;
 - i) Two 8.5 by 11 inch drawings showing the buildings to be included in the existing and build conditions used for this study. These, with building numbers added, are included as Figures 1 and 2.
- 2) Two (2) site visits during which 28 photographs were taken of the buildings on the site and the site's surroundings;
- 3) An evaluation of the urban context of the proposed project;
- 4) A review of wind climate data for Boston; and
- 5) The author's 22 years of experience dealing with pedestrian level winds.

The interaction of the wind with buildings and structures is very complicated and, at times, unpredictable. Thus, this evaluation must be treated as a qualitative assessment of pedestrian level winds.

1.2 *Location and Description of the Project*

The site of the proposed Biomedical Research Center is at the northeast end of The Charlestown Navy Yard next to Building 114 and just across Sixteenth Street from Buildings 75 and 199. The site is currently partly occupied by Buildings 178 and 193, which will be demolished to make room for the proposed project.

Figure 1 depicts the configuration of the site that is considered to be existing conditions for this assessment. Note that the el that currently runs southwest at the north end of Building 114 is not shown since it will be removed to allow Sixteenth Street to be extended to Chelsea Street, and the currently existing Buildings 131, 165, 178, 193, 203, 206, 210, 218A, and 226, all shown in the Land Parcel Plan, Alternate 2, are assumed razed and not replaced. Buildings 77, the easterly extension of 104, 187, 214, and 215c, also shown on the Alternate 2 plan, have already been razed.

Figure 2 is identical to Figure 1 except that the position of Building A of the Biomedical Research Center is shown and the outline of the finished Center is shown by a dotted line.

Building numbers are given in both Figures. For this wind assessment it is important to know the relative heights of all the buildings. They are listed below:

<u>Building</u>	<u>Roof Edge hgt</u> (Feet)	<u>Total hgt</u> (Feet)
P	27	35
75	15	27
106	42	59
114	48	48
199	108	108
266	31	40
Rowhouses	23	30
	50	75
Building A	140 ft.	140 ft.

The vehicular entrance to Building A of the Biomedical Research Center is shown in Figure 2. There will be two main pedestrian entrances: one will be in the middle of the southeast end of the building; and the other in the southwest wall just north of the vehicular entrance. In the discussion that follows, the wind conditions for the configurations depicted in Figures 1 and 2 will be compared.

1.3 *Description of the Area Surrounding the Project*

This is a very exposed site. The Little Mystic Channel runs east-west just north of the site, and the Boston Inner Harbor lies to the east and south. Only to the west and southwest are there significant buildings. Most are 30-50 feet high, but there are a couple of exceptions. Building 149, about the same height as 199, lies to the southwest, just across Thirteenth Street from 199. A little more to the south and about 1400 feet away lies Building 197 at about 120 feet in height. Downtown Boston, including the Financial District with its many 25-40 story buildings, lies across the Boston Inner Harbor about 1.75 miles SSW of the site.

2. THE WIND CLIMATE

2.1 *Variation of Average Velocity with Height*

In general, the natural wind is unsteady (i.e., it is gusty), and its average velocity increases with height above the ground. Figure 3 depicts approximately how the average velocity varies with height for different types of terrains. When one puts up any building, the possibility exists (although generally it does not happen) that the building will bring the higher speed winds at the top of the building down to ground level.

Monolithic buildings (i.e., those that do not change shape with height), if they are significantly taller than most of the surrounding buildings, almost invariably will be windy at their base. However, when there are many buildings of similar height in an area, the buildings tend to shelter one another.

The proposed Building A of the Biomedical Research Center is very exposed to NE, E, and SE winds, and it seems likely that NE and E winds will cause accelerated winds at the pedestrian entrance in the SE wall.

2.2 *Statistical Description of Wind*

The site is about 1.75 miles from Downtown Boston and about 2.25 miles west of Logan Airport. Thus, the wind data from Logan Airport, which is typically used to define winds for Boston, is applicable. Figure 4 depicts a wind rose for Boston. As noted in the figure, the wind rose is based on surface wind data from Logan Airport taken from 1945 to 1965. The length of each line radiating from the center of the figure to the outermost crossing line is proportional to the total time the wind comes from that direction. The other lines crossing the radial lines are for winds less than 3, 12, and 25 mph.

Figure 4 shows that the winds in Boston come primarily from the northwest, west, and southwest. Figures 5-8 show wind roses for Boston for winter (Dec., Jan., and Feb.), spring (Mar., Apr., and May), summer (Jun., Jul., and Aug.), and Fall (Sep., Oct., and Nov.). These figures show that northwest winds tend to occur in the winter, and southwest winds in the summer. Spring and fall are transitional, but winds are stronger in the spring than in the fall. Strong easterly winds usually occur during storms when there is precipitation. Northwest winds blow across the Mystic Tobin Bridge and straight down Thirteenth and Sixteenth Streets. Southwest winds blow up First, Third, and Fifth Avenues.

The effect of these winds as well as easterly storm winds is discussed below separately.

The average wind speed at Logan Airport at 58 feet (the average height at which the data were taken) is 12.9 mph. At pedestrian level (i.e., chest height, 4.5 feet), it is about 8 mph. The average wind speed at 58 feet at Logan Airport for each month is shown in Figure 9. Seasonally, the average is 14.2 mph in the winter, 13.9 mph in the spring, 11.2 mph in the summer, and 12.3 mph in the fall. However, the fastest hourly wind for a 100 hour return period is slightly faster in the spring than in winter.

3. CRITERIA

Since the early 1980s, Boston has used a guideline criterion for acceptable winds of not exceeding a 31 mph effective gust more often than once in 100 hours. The effective gust is defined as the average plus 1.5 times the root mean square (rms) variation about the average.

In 1978, Melbourne developed probabilistic criteria for pedestrian level winds which account for different types of pedestrian activity as well as safety aspects of such winds (see Figure 10). He defined five categories for pedestrian level winds:

- 1) Unacceptable and Dangerous.
- 2) Uncomfortable for Walking.
- 3) Acceptable for Walking.
- 4) Acceptable for Short Periods of Standing or Sitting.
- 5) Acceptable for Long Periods of Standing or Sitting.

These criteria are not absolute (any location can have dangerous winds in a hurricane), but rather they imply that the location would have wind speeds such that the activity suggested is possible most of the time, and would be perceived as such by most people who are at the location frequently. For example, winds at pedestrian level at Logan Airport are just in Category 2, uncomfortable for walking, and just under the guideline 31 mph effective gust wind speed.

4 PEDESTRIAN WINDS AT THE SITE

4.1 *Introduction*

In the following sections, the effects of the northwest (NW) winter winds, the southwest (SW) summer winds, and easterly storm winds will be discussed for the Existing and Build conditions defined in Figures 1 and 2.

For the most part, the weather in New England is dominated by either large coastal storms (fall, winter, and spring) or the Bermuda High (summer). Typically, when a coastal storm occurs, it rains or snows for four to twelve hours, then it clears, and the wind blows from the northwest for three or four days before the next weather system arrives. These storms, and the northwest winds following them, occur mostly in the fall, winter, and spring. Northwest winds are particularly uncomfortable in the winter, when typically they occur on cold days. The Bermuda High is responsible for the southwest winds that occur in the summer.

4.2 *Northwest (Winter) Winds (Figures 11 and 12)*

As previously noted, northwest winds blow across the Mystic Tobin Bridge and directly down Thirteenth and Sixteenth Streets. They can be very uncomfortable on a cold winter day.

4.2.1 *Existing Conditions (Figure 11)*

The removal of the el on Building 114 to allow Sixteenth Street to be extended to intersect Chelsea Street opens Sixteenth Street up to the NW winds coming under the Mystic Tobin Bridge. The removal of Building 217 opens the gap further, so that it is to be expected that there will be significant acceleration of these winds in Sixteenth Street between Buildings 199 and 114. Normally, that area would be windy now, since Building 199 is twice as tall as the upwind buildings, and one would expect the higher winds to be brought down from the top of Building 199. But the Mystic Tobin Bridge is about the same height as Building 199 in that area and probably significantly reduces the NW winds coming at the upper stories of Building 199. As a result, it seems likely that winds at both the north and west corners of Building 199 are accelerated, but not as much as without the Mystic Tobin Bridge. It seems likely that the winds at the north corner of Building 199 will be in mid or high Melbourne Category 3, and those at the west end in mid or low Category 3.

The only other place where one might expect accelerated NW winds in the area under consideration for the existing conditions shown in Figure 11 is near and under the pedestrian overpasses at the corner of Thirteenth Street and Third Avenue. The main pedestrian entrances to both Buildings 199 and 149 are under these overpasses. Normally, one would expect the winds there to be high in Category 3 or low in Category 2. But with the Mystic Tobin Bridge upstream, they are probably no worse than high Category 3.

The the winds at the Harborwalk along the Little Mystic Channel and Boston Inner Harbor will probably be high in Melbourne Category 3 due to its very exposed nature (its exposure is similar to that at Logan Airport). Toward the Harborwalk's southern end, particularly near the Rowhouses, it will be less windy, since much of Harborwalk in that area is in the lee of some of the buildings.

Most other places in the area under consideration will be in Melbourne's Categories 4 or 5, and it seems unlikely that the guideline effective gust wind speed will be exceeded anywhere in the area of consideration for NW winds.

4.2.2 *With Building A in Place (Figure 12)*

The addition of Building A to the site will have little or no effect on the winds at the SW end of Building 199 or on the Harborwalk, except in the lee of Building A where the winds will be reduced. It will cause an increase in the winds along Sixteenth Street between Building 199 and Building A for NW winds. However, the effect will be much less than one would normally expect, because the narrow street between Buildings 114 and A will cause the high winds at the west corner of Building A to be near the roof level of Building 114 instead of at ground level.

In any case, the entrance to Building A to the north of the vehicle entrance will probably be in Melbourne's Category 3 for NW winds, but the entrance in the middle of the southeast (SE) facade will be in the lee of the building and probably in Category 5.

4.3 *Southwest (Summer) Winds (Figures 13 and 14)*

The prevailing winds in the summer are from the southwest. Southwest winds approach the site coming directly up First and Fourth Avenues from the west end of the Yard. It should be borne in mind that, on hot summer days, some windiness may be desirable.

4.3.1 *Existing Conditions (Figure 13)*

For SW winds, with the exception of Buildings 149 and 197, all upwind buildings are 2 to 5 stories and act to shield the buildings of similar height on the site (P, 75, 106, 266, and the Rowhouses). Building 149 is the same height as Building 199, and is just across Thirteenth Street and slightly displaced to the south. As such, it provides considerable shielding for Building 199. Thus, the south corner of Building 199 is probably never windy for SW winds, and the west corner only somewhat windy for the more westerly of these SW winds (Melbourne 3 at most).

Most of the Harborwalk at Yard's End is always in the lee of Navy Yard buildings for SW winds and, thus, will be quite pleasant in the summer (probably in Melbourne 4 or 5). However, where the Harborwalk passes the small tower at the SE end of the Rowhouses, there may be some windiness (Melbourne 3).

For SW winds, the corner of Fifth Avenue and Sixteenth Street may be somewhat windy due to Building 114 deflecting the wind SE down Sixteenth Street (Melbourne 3 or 4).

Finally, because the tower at the NW end of the Rowhouses is considerably taller than any of the buildings upwind of it, for SW winds its west corner may be a little windy (Melbourne 3).

All areas not specifically mentioned are expected to be in Melbourne Category 4 or 5.

4.3.2 *With Building A in Place (Figure 14)*

Placing Building A on the site will have little or no effect on the winds near the Rowhouses or at the west end of Building 199. Normally, one would expect it to reverse the SE winds in Sixteenth Street, but with both Buildings 199 and 149, which are of similar height and upstream of Building A, those winds will be reduced, but not reversed. Also, the expected accelerated winds near the pedestrian entrance in the SE wall will be much reduced for the same reason (certainly no worse than Melbourne 3).

Finally, Building A will provide sheltering for the portion of Harborwalk that lies to the northeast (NE) of it. All areas not specifically mentioned are expected to be in Melbourne Category 4 or 5.

4.4 *Storm (Easterly) Winds (Figures 15 and 16)*

Easterly winds occur about one third of the time. Light easterly winds occur as a storm first starts or in the summer as a sea breeze. During the first 4-12 hours of a typical coastal storm, it rains or snows depending on the temperature, and the wind is generally from the northeast or southeast depending on whether the center of the storm passes to the east or west of the city.

Since, for strong easterly winds, it will generally be snowing or raining, the emphasis in the following discussions will be on entering or exiting the various buildings.

4.4.1 *Existing Conditions (Figure 15)*

The entire area under consideration is very exposed to easterly winds, and that is especially true for the Harborwalk. However, since pedestrians will not be out to enjoy a pleasant walk during storms, this is not a problem. Most people out in a storm expect it to be windy, and for light winds there is no problem.

Again, the Harborwalk near the tower at the south end of the Rowhouses will have accelerated winds at such times.

For NE winds, the east corner of Building 114 may be windy, but there is no sidewalk or entrance near the east corner.

NE winds also will make the north and east corners of Building 199 windy, the east corner perhaps more than the north, because the north corner is somewhat shielded by Building 114. There is neither an entrance near each corner, nor is there a walkway to another area, so there is no need for pedestrians to be in the vicinity. However, because of the presence of Building 149, the main entrances to Buildings 149 and 199 under the pedestrian overpasses above Thirteenth Street are likely to be windy in NE storms.

East and southeast winds cause similar problems, and since the main entrance to Building 199 is on the SW wall near its south corner, such winds probably currently make that entrance and the entrance to Building 149 windy, but no more than high Melbourne 3.

The north and east corners of the small tower at the NW end of the Rowhouses will also be windy.

The shapes of Buildings 75 and 106 are such that they will not cause significantly accelerated winds near their north and east corners.

4.4.2 *With Building A in Place (Figure 16)*

When Building A is in place, it will shield the north and east corners of Building 199, reducing the winds there.

For NE and E winds, the pedestrian entrance to Building A just north of the vehicular entrance on Sixteenth Street will be shielded from the wind. On the other hand, the entrance at the southeast end of the building will see highly accelerated flow (Melbourne 2). This will not be true when the rest of the Biomedical Center is completed, since then it will be shielded by the other buildings in the complex. This could prove a serious problem, but could be solved by use of an appropriate temporary wind break as sketched in Figure 2.

For NE winds, Building A will shield Buildings 199 and 149 and, thus, reduce any current windiness at their main entrances, but for east and SE winds, the windiness there could become slightly worse. Again, building the rest of the Biomedical Research Center will help for east winds. The completion of the new New England Aquarium will probably help for SE winds. Trees and wind breaks may be necessary to mitigate these winds until these other buildings are completed.

5. SUMMARY

An assessment of the effect of adding Building A of the proposed Biomedical Research Center to the Charlestown Navy Yard complex has been made. This assessment assumes all buildings scheduled to be demolished are demolished for the existing conditions. While, for both NW winter and SW summer winds, there are some minor increases in winds near Building A when it is added, no seriously windy areas will be caused by the addition of Building A.

On the other hand, easterly storm winds will cause much windiness at the main entrance of Building A and possibly increase the current windiness at the existing main entrances to Buildings 149 and 199. Both these windy areas will be mitigated by the completion of the rest of the Biomedical Research Center and the New England Aquarium. Temporary wind breaks such as trees and shrubs or a slotted wall could be used near the main entrance to Building A (see Figure 2) until these other planned buildings are completed.

JW/atm/jjm/11462/r-charle

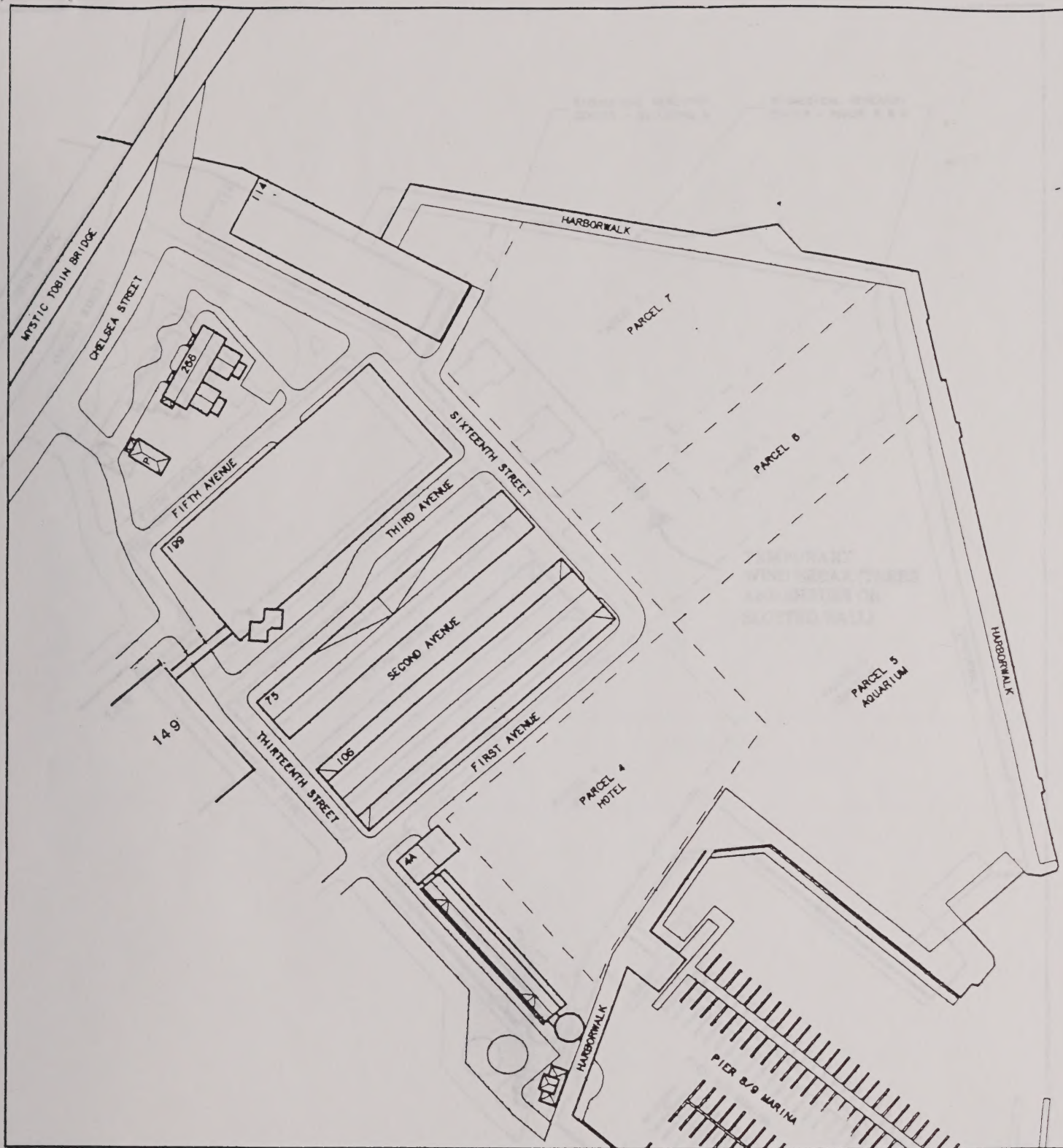
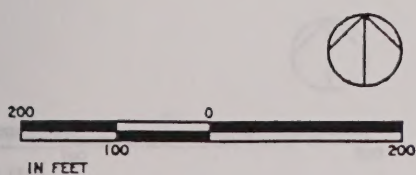


Figure 1

Existing Conditions



Charlestown Navy Yard
Biomedical Research Center
Building A, Wind Assessment
Prepared By: Frank H. Durgin, P.E.

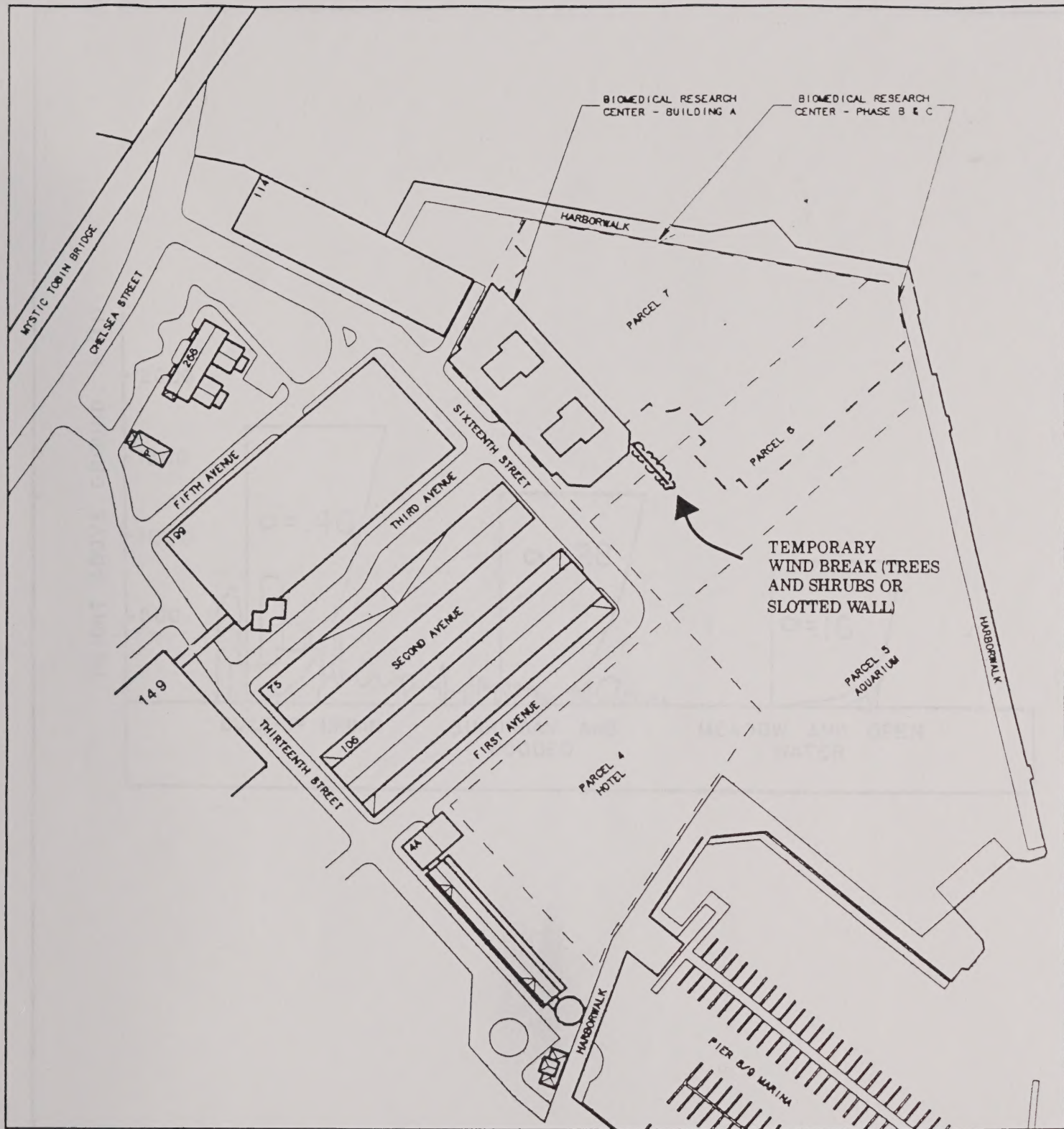
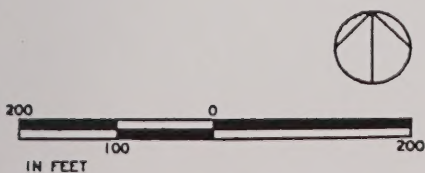


Figure 2 Proposed Conditions



Charlestown Navy Yard
Biomedical Research Center
Building A, Wind Assessment
Prepared By: Frank H. Durgin, P.E.



Figure 3

Types Of Earth's Boundary Layer — — Davenport

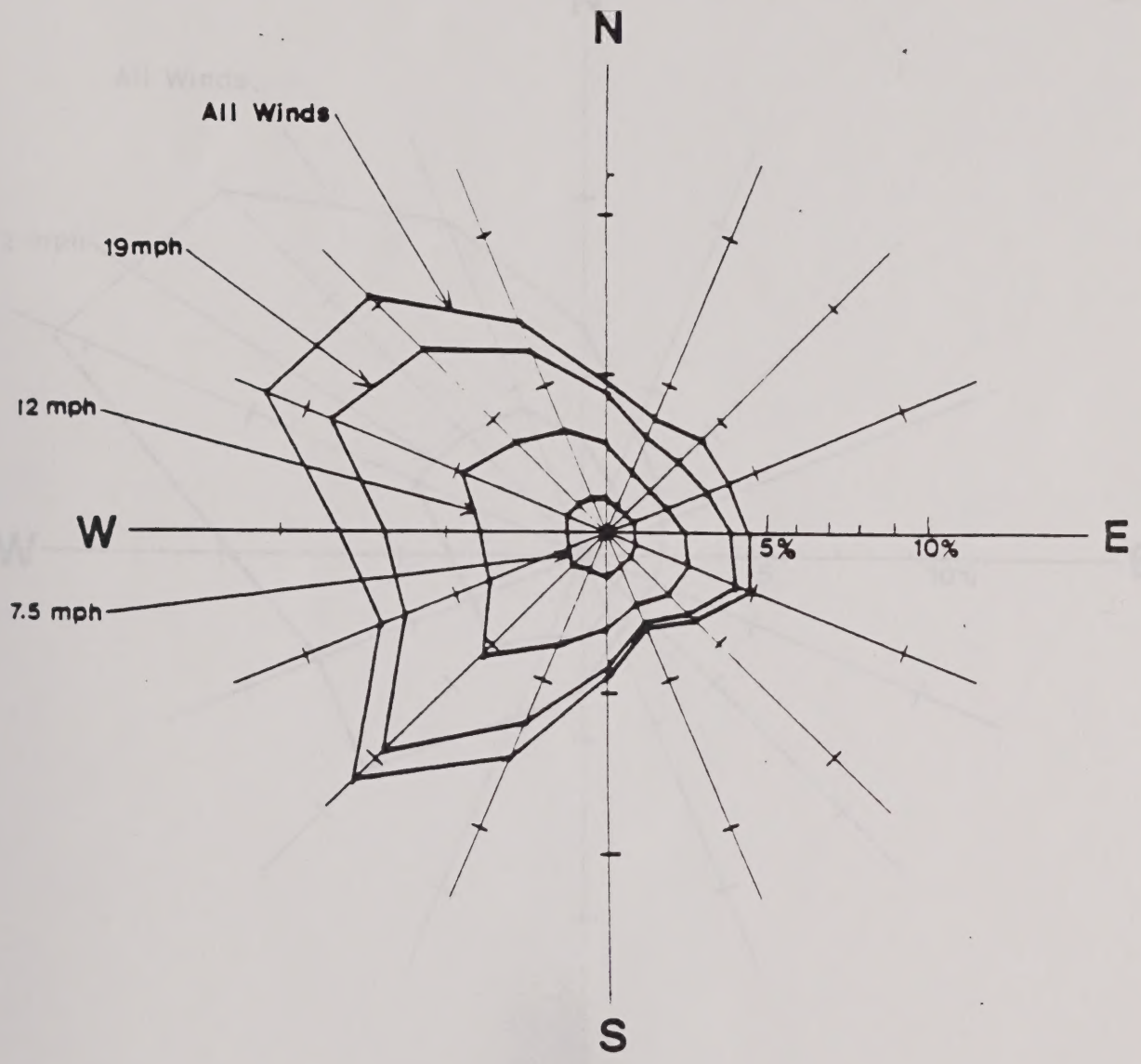


Figure 4

Boston Wind Rose For The Year
Surface Data Obtained From Logan Airport 1945-1965

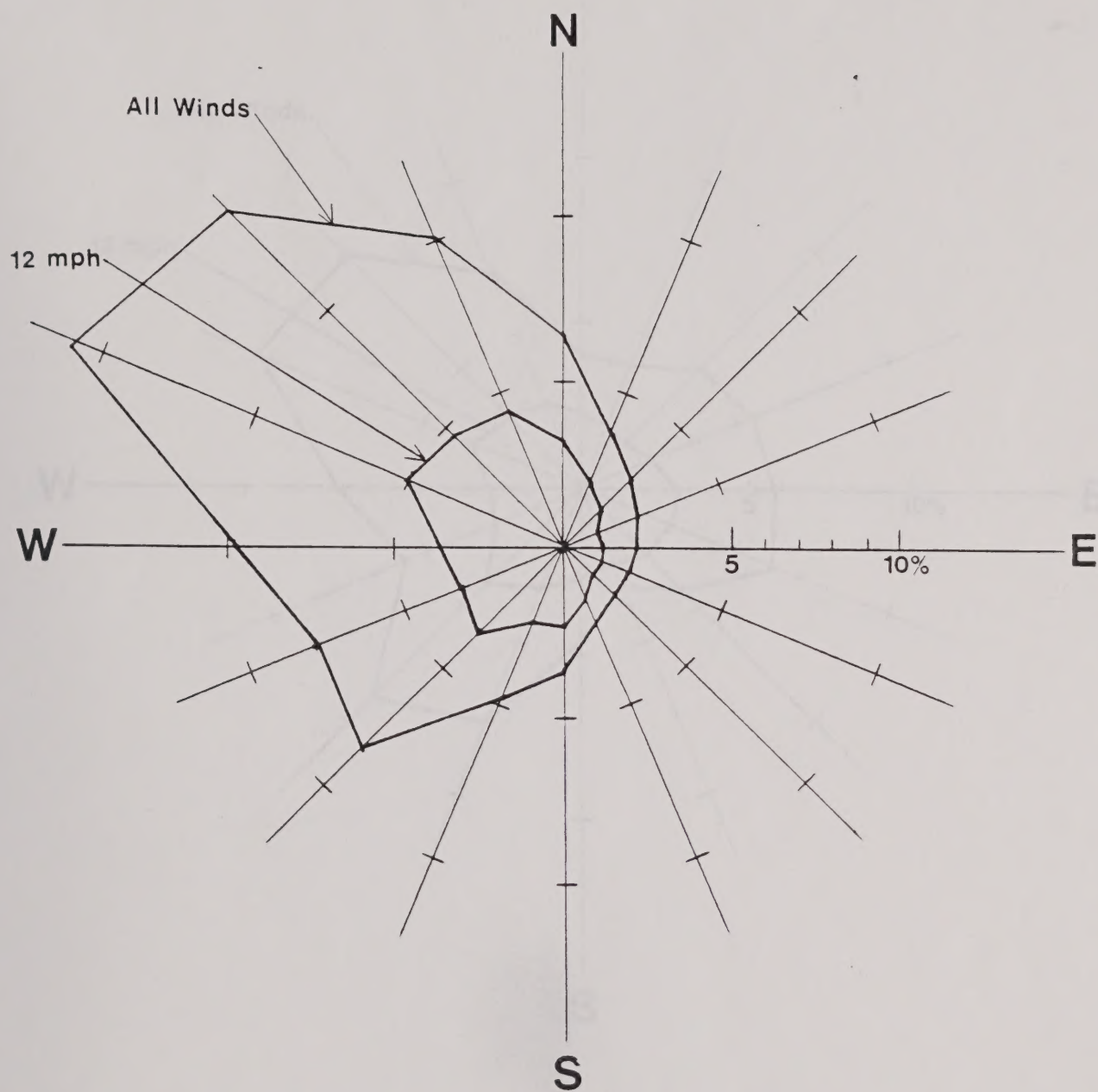


Figure 5

Boston Wind Rose For The Winter (December, January, February)

Surface Data Obtained From Logan Airport 1945-1965

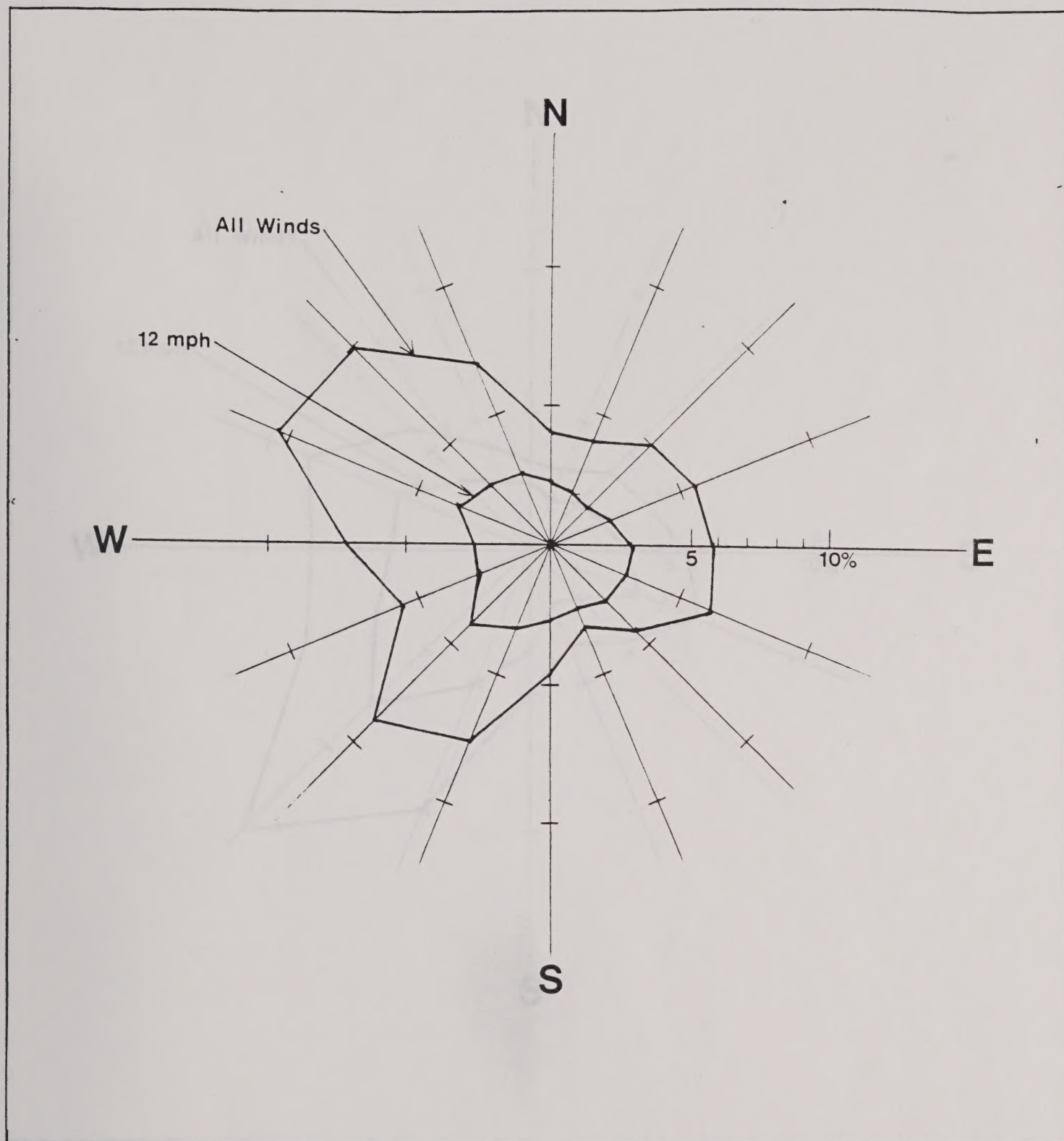


Figure 6

Boston Wind Rose For The Spring (March, April, May)

Surface Data Obtained From Logan Airport 1945-1965

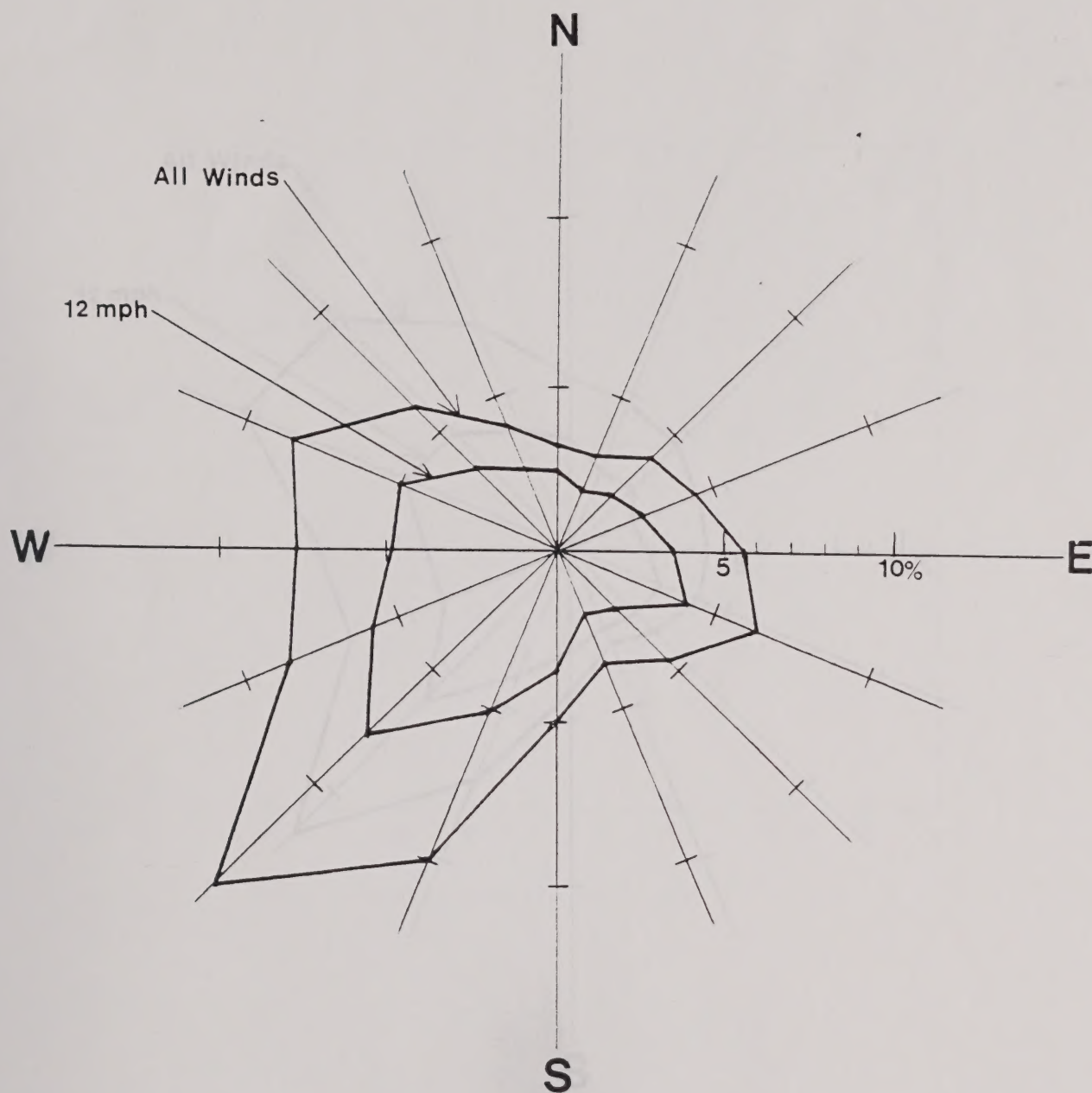


Figure 7

Boston Wind Rose For The Summer (June, July, August)

Surface Data Obtained From Logan Airport 1945-1965

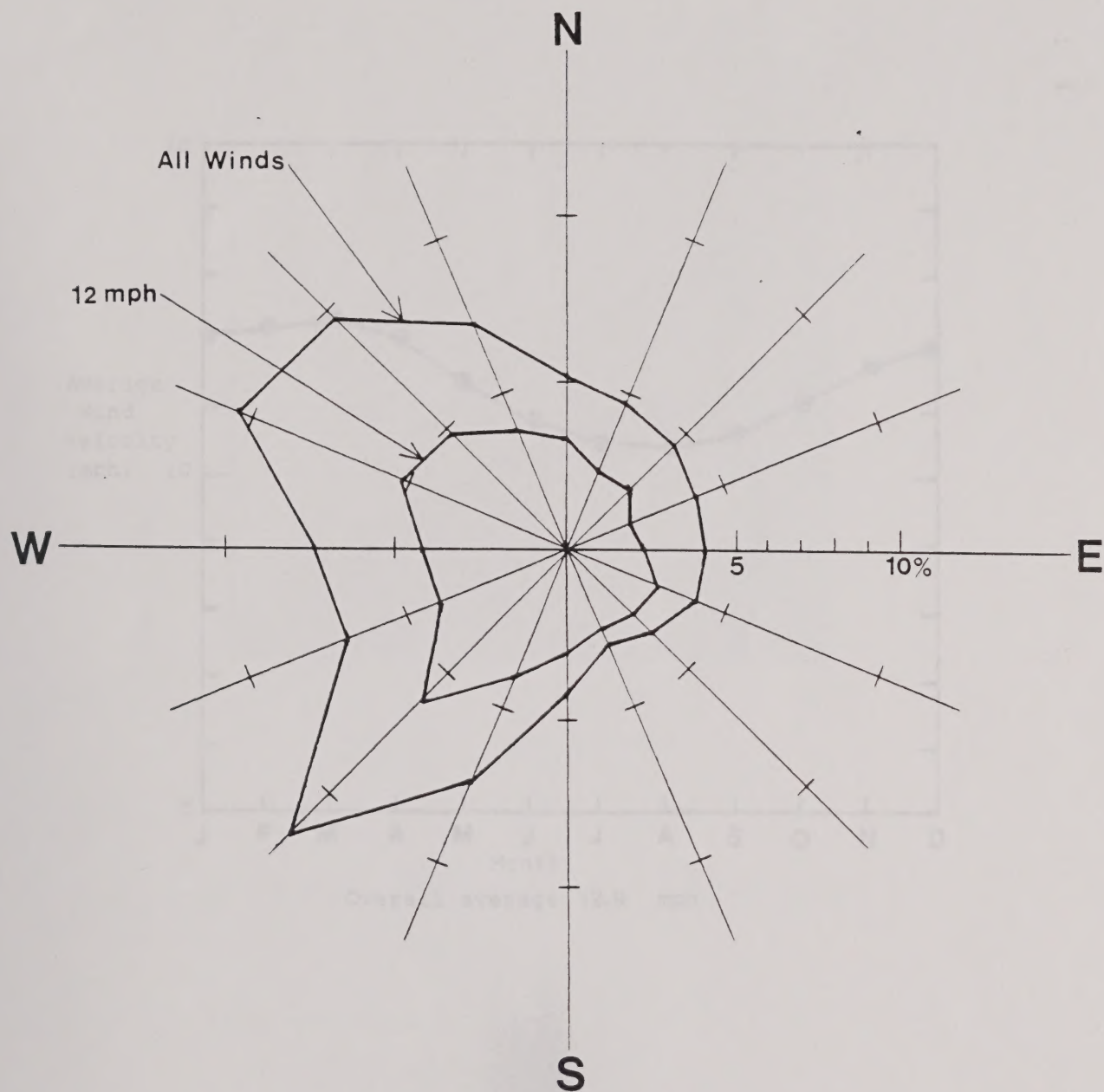


Figure 8

Boston Wind Rose For The Fall (September, October, November)

Surface Data Obtained From Logan Airport 1945-1965

Charlestown Navy Yard
Biomedical Research Center
Building A, Wind Assessment
Prepared By: Frank H. Durgin, P.E.

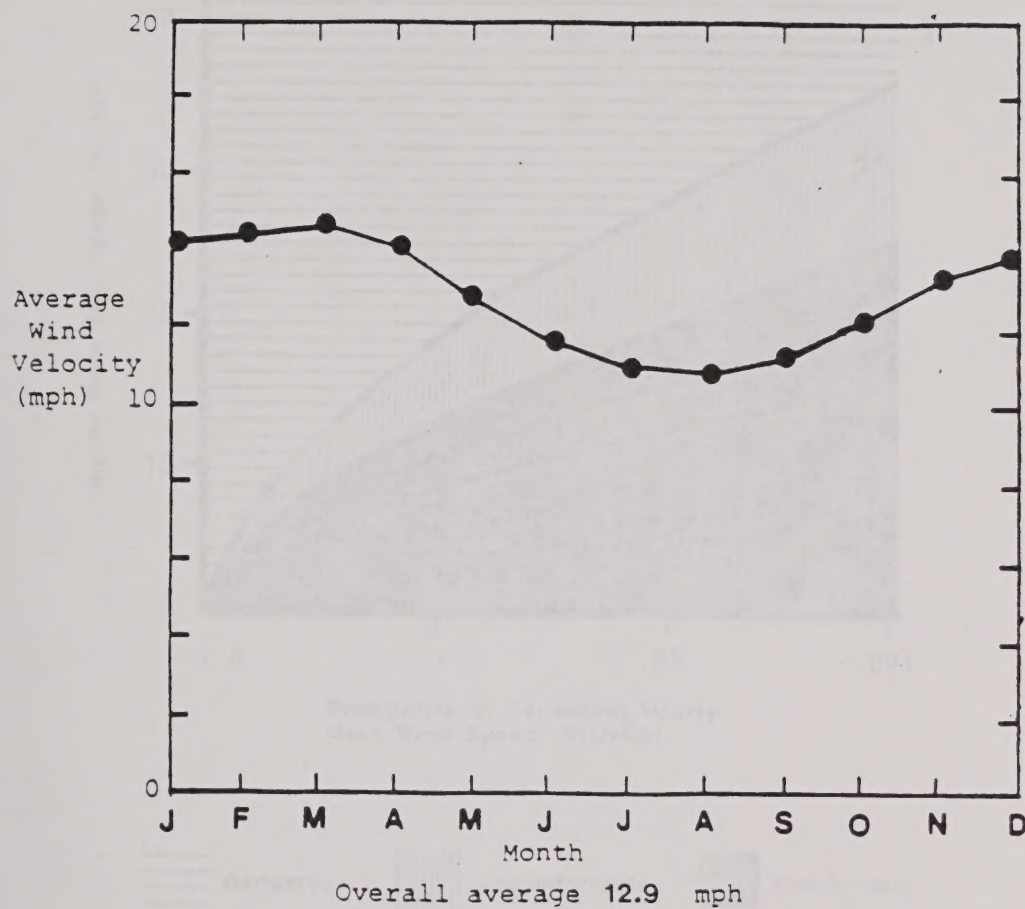
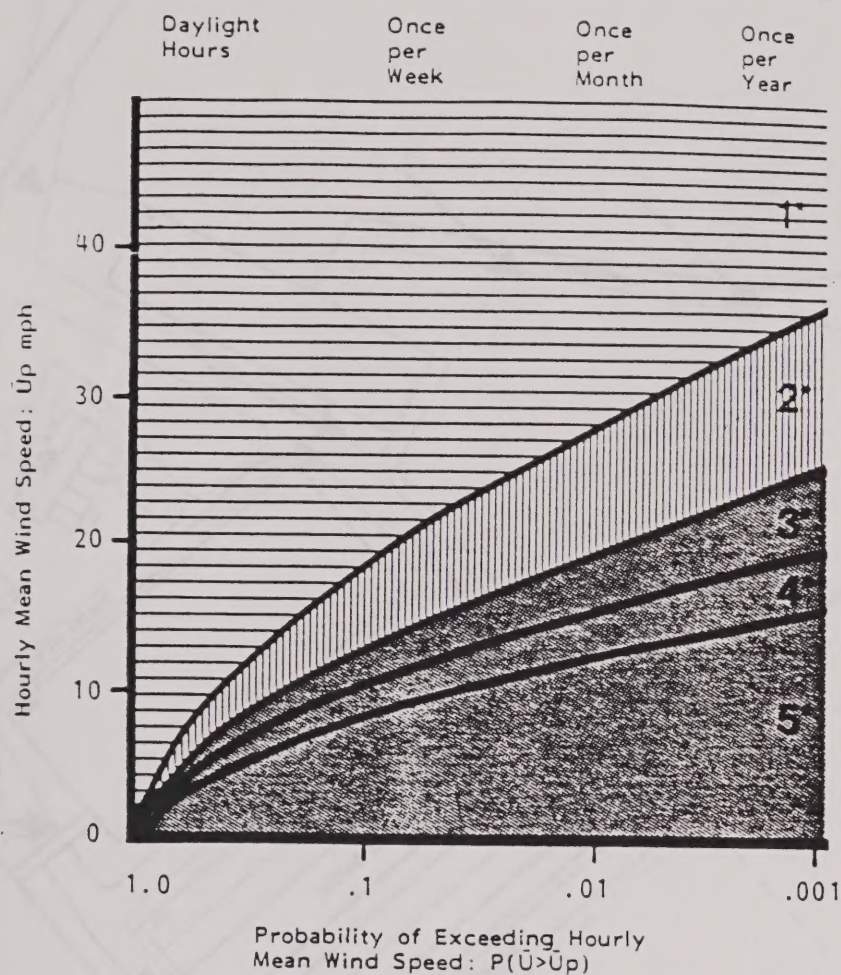


Figure 9

Average Wind Velocity At Logan Airport At 58 ft, 1945-1965, By Month



 Dangerous
  Uncomfortable
  Comfortable

* Melbourne's Category

- 1 Unacceptable and dangerous
- 2 Uncomfortable for walking
- 3 Acceptable for walking
- 4 Acceptable for short periods of standing or sitting
- 5 Acceptable for long periods of standing or sitting

Figure 10

Melbourne's Category

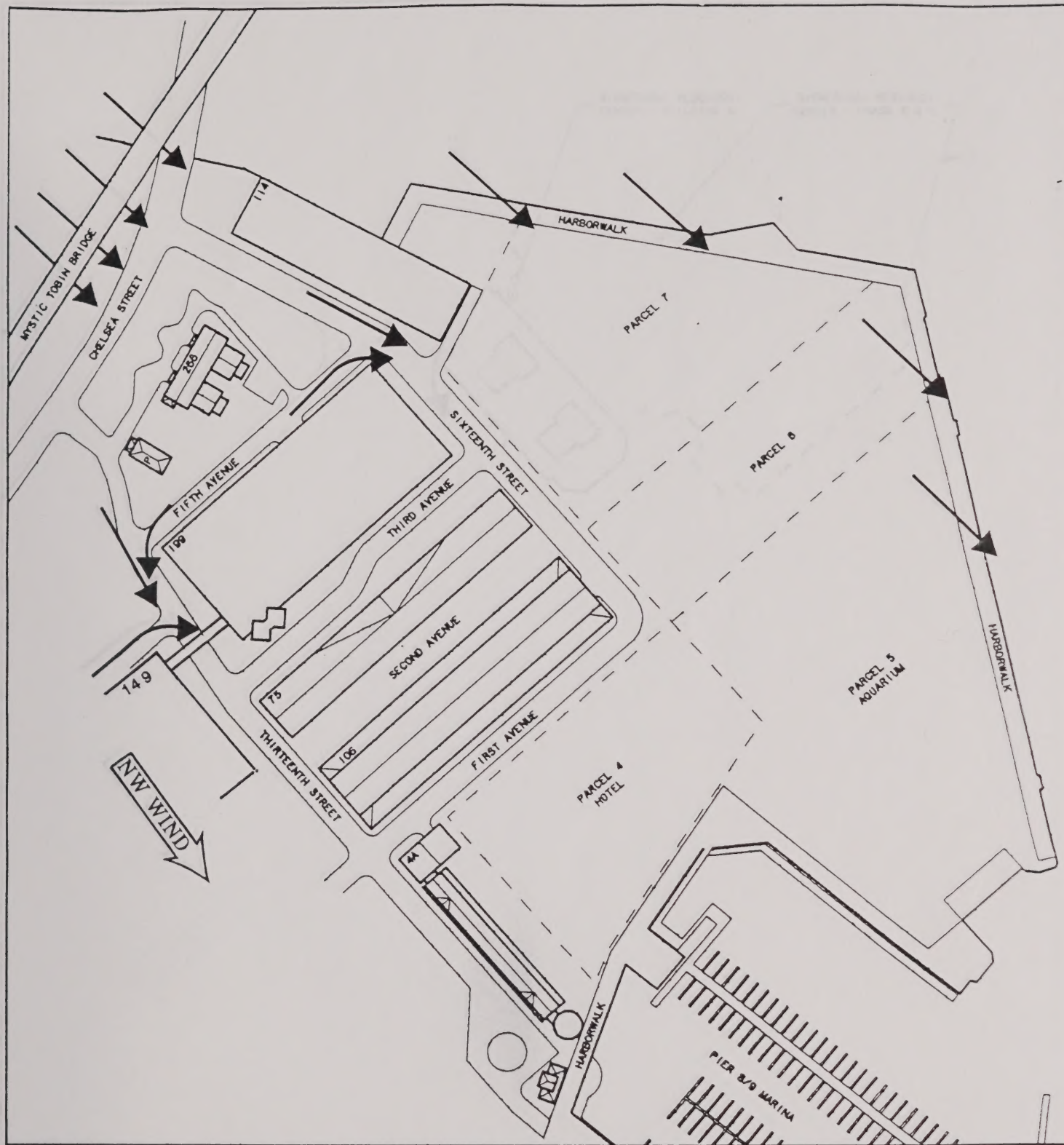
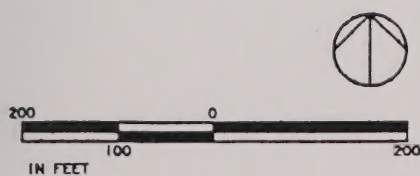


Figure 11

Existing Condition Wind Flow Patterns - Winds From Northwest



← Local Wind Direction

Charlestown Navy Yard
Biomedical Research Center
Building A, Wind Assessment
Prepared By: Frank H. Durgin, P.E.

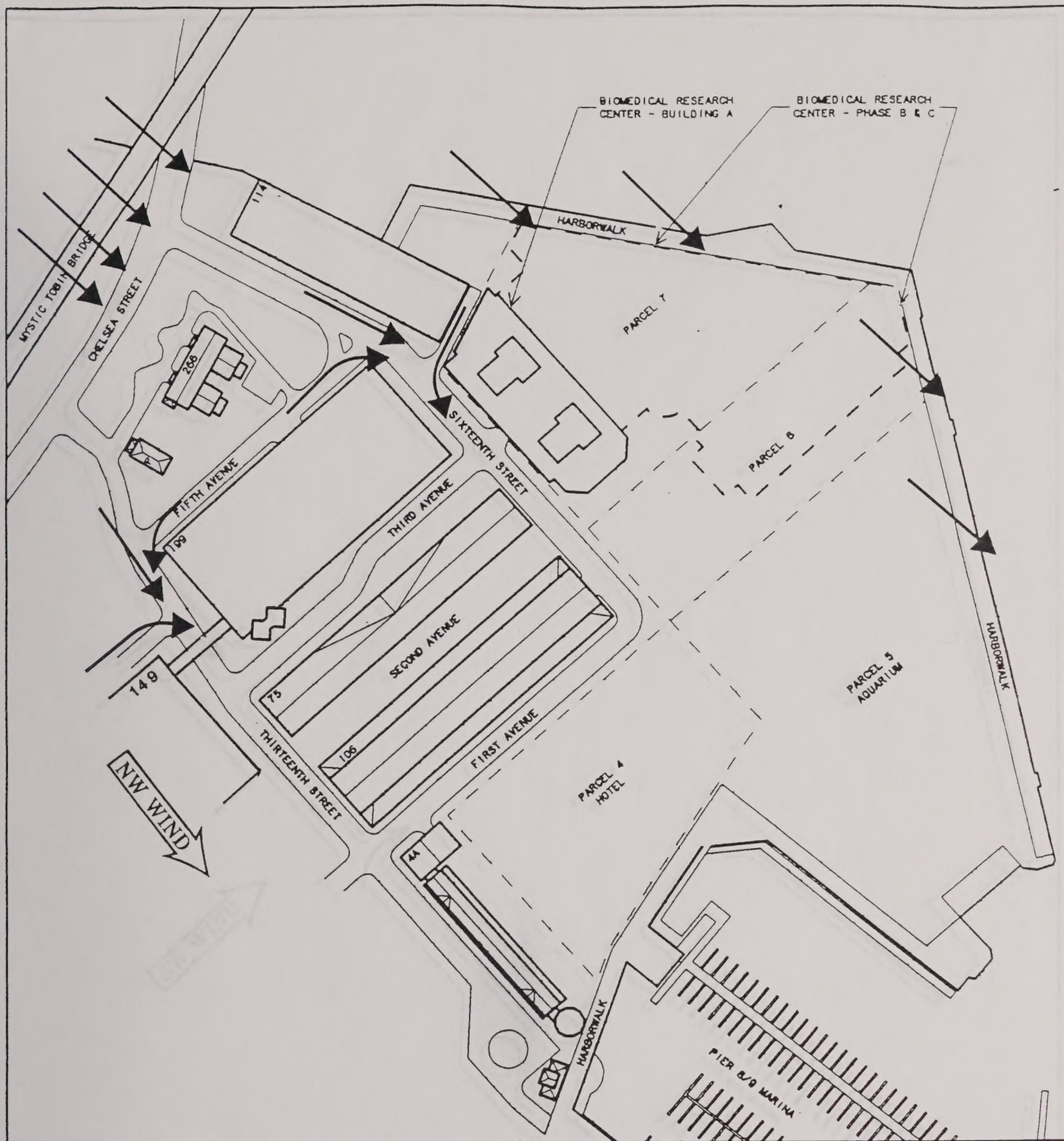
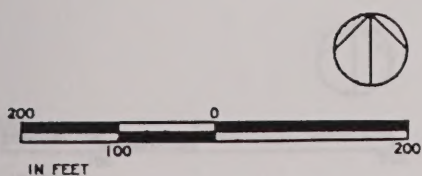


Figure 12

Proposed Condition Wind Flow Patterns - Wind From Northwest



← Local Wind Direction

Charlestown Navy Yard
Biomedical Research Center
Building A, Wind Assessment
Prepared By: Frank H. Durgin, P.E.

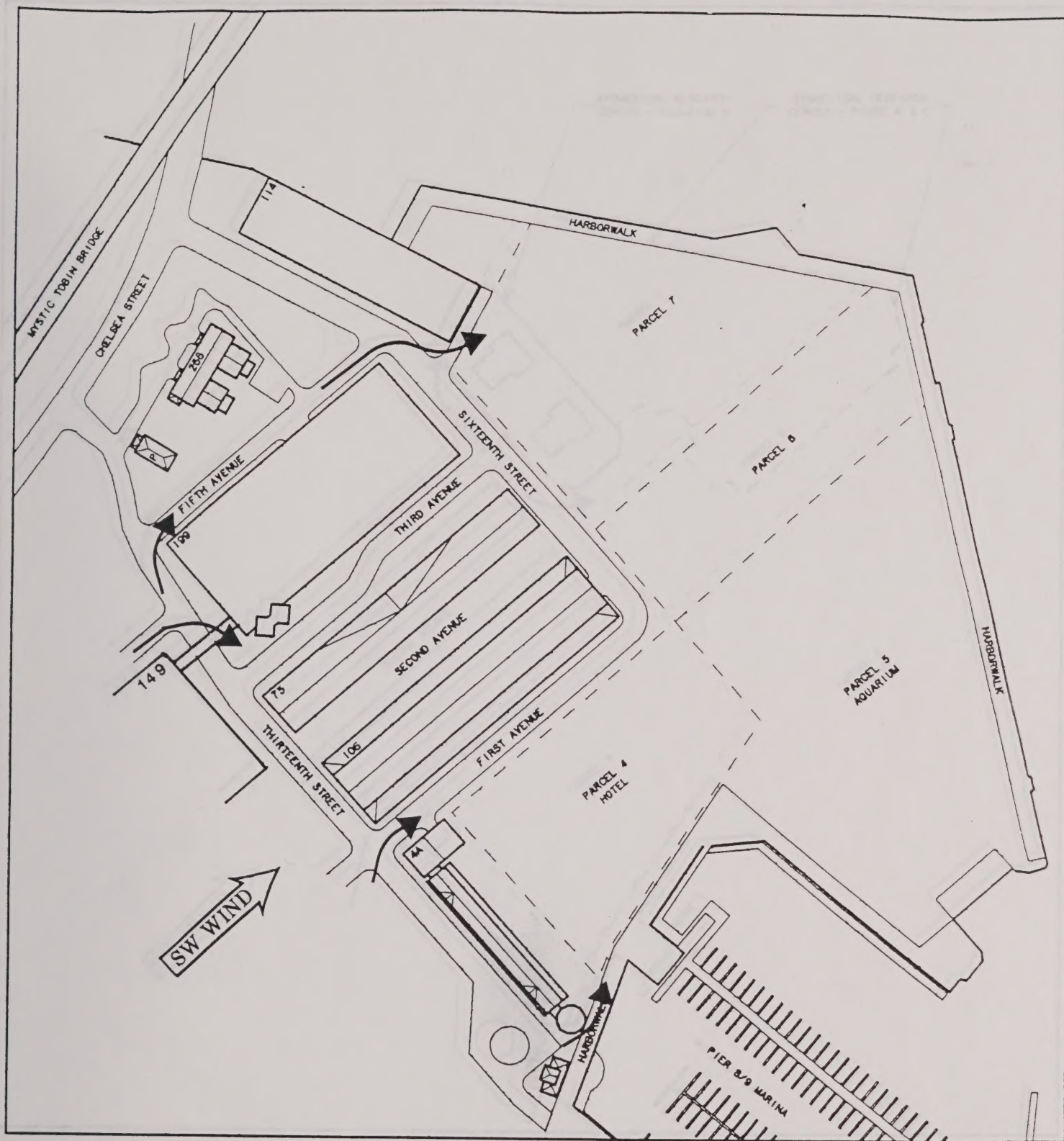
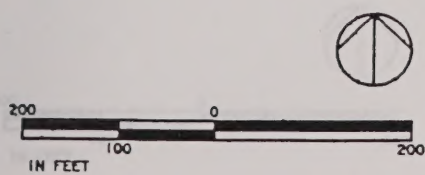


Figure 13

Existing Condition Wind Flow Patterns - Wind From Southwest



Local Wind Direction

Charlestown Navy Yard
Biomedical Research Center
Building A, Wind Assessment
Prepared By: Frank H. Durgin, P.E.

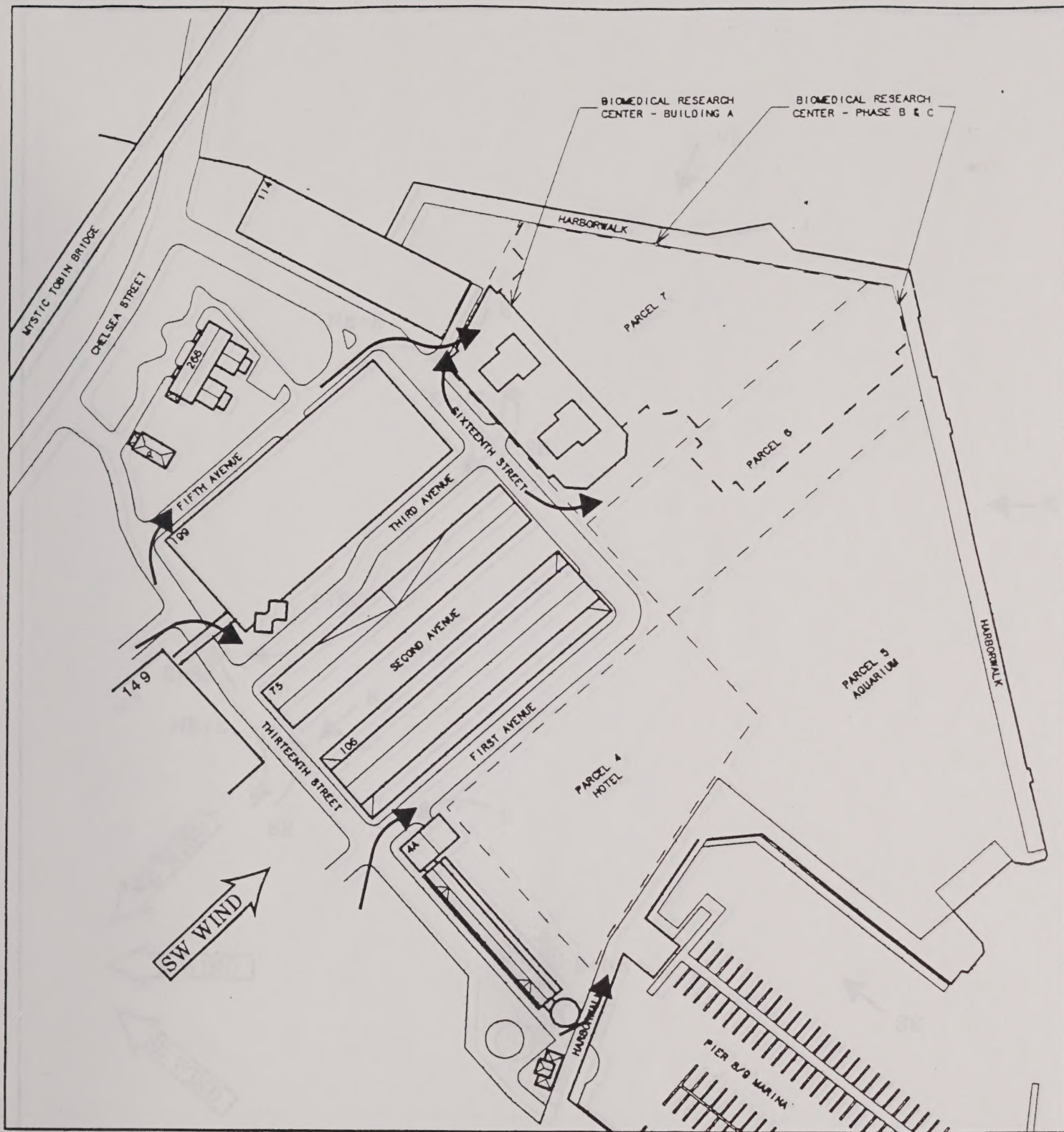


Figure 14

Proposed Condition Wind Flow Patterns - Wind From Southwest

Charlestown Navy Yard
Biomedical Research Center
Building A, Wind Assessment
Prepared By: Frank H. Durgin, P.E.

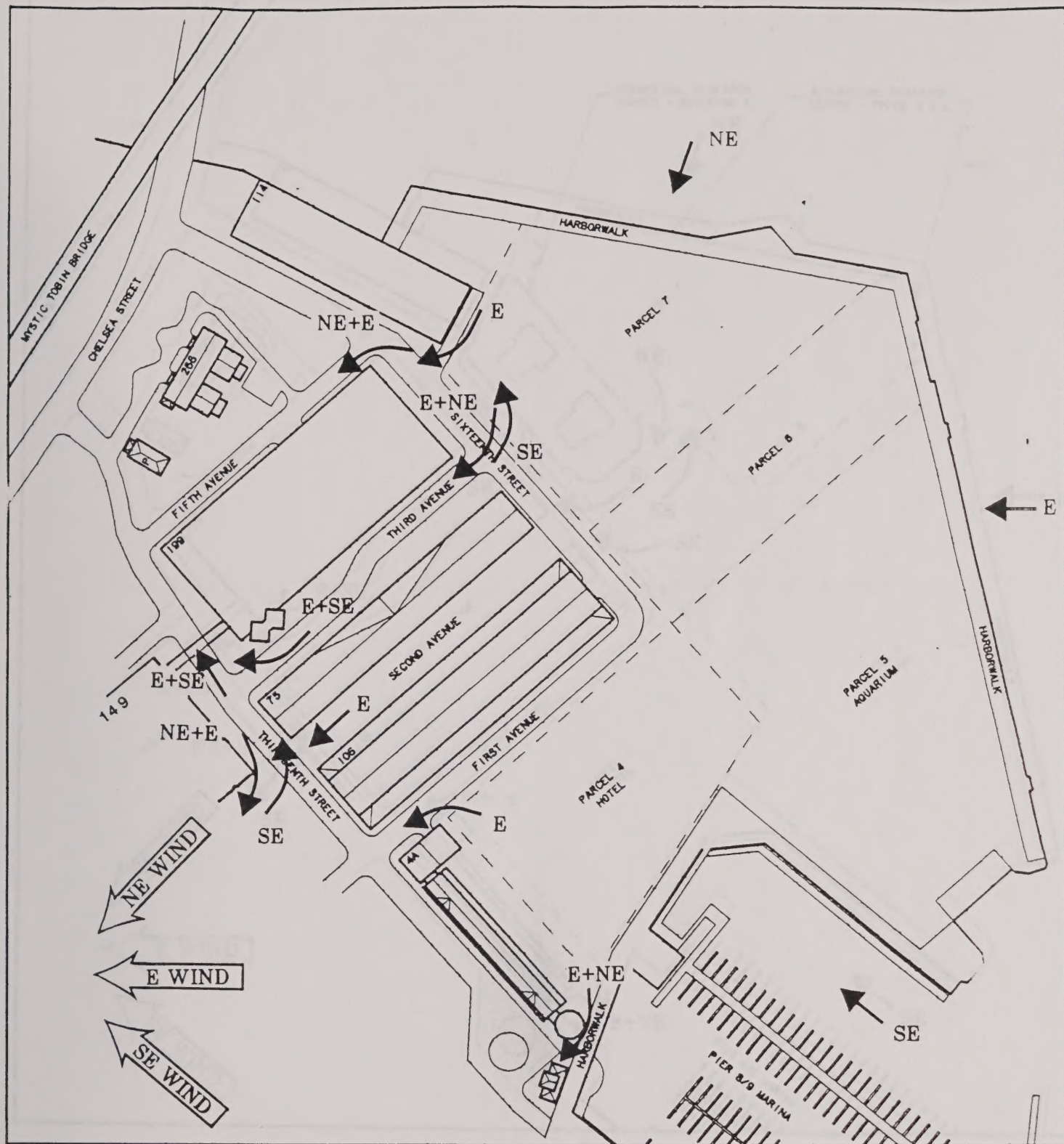
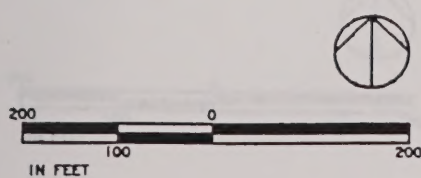


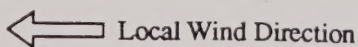
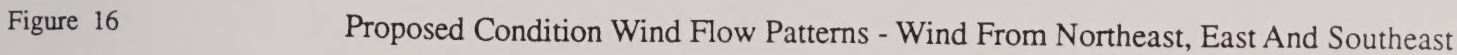
Figure 15

Existing Condition Wind Flow Patterns - Wind From Northeast, East And Southeast



Local Wind Direction

Charlestown Navy Yard
Biomedical Research Center
Building A, Wind Assessment
Prepared By: Frank H. Durgin, P.E.



Charlestown Navy Yard
Biomedical Research Center
Building A, Wind Assessment
Prepared By: Frank H. Durgin, P.E.

CHARLESTON NAVY YARD

BIOMEDICAL RESEARCH CENTER - BUILDING A

SHADOW ANALYSIS

APPENDIX B

SHADOW ANALYSIS - BUILDING A - BIOMEDICAL RESEARCH CENTER

Prepared for: Naval Facilities Engineering Command

Prepared by: Smith Associates, Inc.

Date: August 15, 1994

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CHARLESTOWN NAVY YARD

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Prepared for: Boston Redevelopment Authority

Prepared by: Sasaki Associates, Inc.

Date: August 20, 1991

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INTRODUCTION

This study addresses existing conditions and the shadow impacts produced by the proposed Biomedical Research Center - Building A on pedestrian open space areas in the vicinity of the site. The open space areas of concern include the proposed Harborwalk, the proposed Yard's End Park at the New England Aquarium site, and the pedestrian walkways along Second Avenue and Sixteenth Street.

EXISTING AND PROPOSED CONDITIONS

Current land uses in the area that will be subject to shadows cast by Building A are primarily vacant land parcels, or vacant industrial buildings characterized by low rise, large-footprint, warehouse-type buildings. The only existing occupied building that will be affected by shadows cast from Building A is Building 199, which currently functions as a parking garage. Existing uses and open space areas in the vicinity of the site, because of their vacant condition, will not be adversely impacted by shadows cast from Building A.

The proposed project is part of the Charlestown Navy Yard Redevelopment Plan. Future uses and pedestrian areas planned for the immediate area include the following:

Proposed Uses

- Biomedical Research Center Phases B and C consisting of two buildings and located north and east of Building A on Parcels 7 and 6.
- The New England Aquarium at Drydock 5 located southeast of Building A on Parcel 5.
- A 400-suite hotel located on Parcel 4 and south of Building A.
- A public parking garage to be built within the shell of the existing Building 114.

Proposed Pedestrian Areas

- Harborwalk - a continuous pedestrian thoroughfare along the waterfront providing a pedestrian link between the USS Constitution and the Aquarium and other Navy Yard uses. A portion of the Harborwalk is located to the north of Building A and is separated from Building A by the proposed Biomedical Research Center Phases B and C.
- Yard's End Park - a park space and plaza located between the Aquarium and Building A, at the end of First Avenue on Parcels 5 and 6.
- A park located west of the intersection of Fifth Avenue and Sixteenth Street.
- Sixteenth Street - a secondary auto and pedestrian thoroughfare.

- Second Avenue - a major pedestrian axis for the Navy Yard Redevelopment area, starting at Fifth Street and extending to the Biomedical Research Center and Yard's End Park.

METHODOLOGY

Shadows were projected for Building A on four (4) key days of the year: March 21, June 21, September 21, and December 21 to establish a representative view of shadow impacts through the four seasons. Morning (9 AM), noon (12 PM), and afternoon (3 PM) shadows were calculated in order to understand the movement of shadows throughout each day.

Solar time was used to calculate the altitude and azimuth of the sun for each time, using geographical data about Charlestown (42'-23" N latitude, 71'-03" W longitude), the day length effects of the elliptical nature of the earth's rotation around the sun, and Daylight Savings Time. These factors result in solar time that can differ from clock time by thirty minutes or more. Daylight Savings Time was taken into account for June and September shadow calculations.

Graphics were prepared to show (1) existing condition shadows and (2) shadows of the Proposed Project, and are intended to give a general understanding of shadow impact areas (See Figures 1 to 24).

ANALYSIS OF IMPACTS

March 21: March 21 is the Vernal Equinox, the mid-point in the year when day and night are equivalent in length.

March 21/9:00 AM (EST). (See Figures 1 and 2.)

Shadows from Building A will be cast on a portion of the northeastern half of Sixteenth Street. A 30 foot segment of the Harborwalk just north of Building 114 will be in shadow at this hour.

March 21/12:00 Noon (EST). (See Figures 3 and 4.)

A 30 foot segment of the Harborwalk north of Building A will be in shadow at this hour.

March 21/3:00 PM (EST). (See Figures 5 and 6.)

An 190 foot segment of the Harborwalk directly north of future Phases B and C of the Biomedical Research Center will be in shadow at this hour. Portions of the entry plaza which will serve Phases B and C of the Biomedical Research Center also will be cast in shadow at this hour.

June 21: June 21 is the longest day of the year when shadows are shorter than at any other time.

June 21/9:00 AM (DST). (See Figures 7 and 8.)

Shadows from Building A will be cast on both sides of Sixteenth Street for those sections of Sixteenth Street that are adjacent to Building A and adjacent to the southern half of Building 114.

June 21/12 Noon (DST). (See Figures 9 and 10.)

The service driveway between Building A and Building 114 will be in shadow at this hour.

June 21/3:00 PM (DST). (See Figures 11 and 12.)

Portions of the entry plaza which will serve Phases B and C of the Biomedical Research Center will be cast in shadow at this hour.

September 21: Although September 21 is the Autumnal Equinox, Daylight Savings Time is in effect, and shadows are somewhat longer than they are at the same hour on the Vernal Equinox.

September 21/9:00 AM (DST). (See Figures 13 and 14.)

Shadows from Building A will be cast on portions of Sixteenth Street adjacent to Building A and adjacent to Building 114.

September 21/12 Noon (DST). (See Figures 15 and 16.)

The service driveway between Building A and Building 114 and a 50 foot segment of Harborwalk north of Building 114 will be cast in shadow at this hour.

September 21/3:00 PM (DST). (See Figures 17 and 18.)

An 120 foot segment of the Harborwalk directly north of future Phases B and C of the Biomedical Research Center will be in shadow at this hour. A small portion of the entry plaza which will serve Phases B and C of the Biomedical Research Center also will be shaded at this hour.

December 21: December 21 is the Winter Solstice when days are shortest, shadows longest, and outdoor activity is generally at a minimum.

December 21/9:00 AM (EST). (See Figures 19 and 20.)

Shadows from Building A will be cast on the service driveway between Building A and Building 114 and cast on a 40 foot segment of the Harborwalk located north of Building 114.

December 21/12 Noon (EST). (See Figures 21 and 22.)

A portion of the service driveway between Building A and Building 114 and a 235 foot segment of the Harborwalk will be cast in shadow at this hour.

December 21/3:00 PM (EST). (See Figures 23 and 24.)

A 220 foot segment of the Harborwalk directly north of future Phases B and C of the Biomedical Research Center will be in shadow at this hour, as will a small portion of the entry plaza which will serve Phases B and C of the Biomedical Research Center.

CONCLUSIONS

The mass and height of the Proposed Building A project will have minimal negative shadow impacts on proposed active pedestrian open space areas in the vicinity of the site. The shadow analysis indicates that the areas where net new shadow will be cast from Building A include the Harborwalk, Sixteenth Street, and the future Entry Plaza for Phases B and C of the Biomedical Research Center.

Entry Plaza - The northern portion of the future entry plaza area serving Biomedical Research Center Phases B and C will be in partial shadow at 3:00 PM for all four seasons studied (see Figures 6, 12, 18 and 24). However, the most extensive shadow cast on this area will be during the summer afternoons when the shading caused by Building A could be very desirable.

Sixteenth Street - Building A will cast shadows on Sixteenth Street at 9:00 AM in the morning during March, June and September (see Figures 2, 8 and 14). However, no shadows will be cast in this area in the winter.

Harborwalk - Building A will cast shadows on the Harborwalk during noon and 3:00 PM in September and cast shadows on the Harborwalk at 9:00 AM, Noon and 3:00 PM in March and December (see Figures 2, 4, 6, 16, 18, 20, 22 and 24).

MITIGATION

The net new shadows generated by Building A fall within the general guidelines for shadow impact stipulated by the June 1991 Charlestown Navy Yard Redevelopment Draft Supplemental Environmental Impact Report (DSEIR). The DSEIR indicates that the overall development of the Charlestown Navy Yard Master Plan is designed to enhance sunlight in areas of greatest pedestrian activity. In this respect, net new shadows cast by Building A have a minimal adverse impact on high activity pedestrian areas in the vicinity of the site. Building A will have no adverse shadow impact on Yard's End Park, or the First Avenue and Second Avenue pedestrian thoroughfares. However, Building A will have some shadow impact on the Harborwalk adjacent to parcel 7 during fall, winter, and spring, but not during the summer.

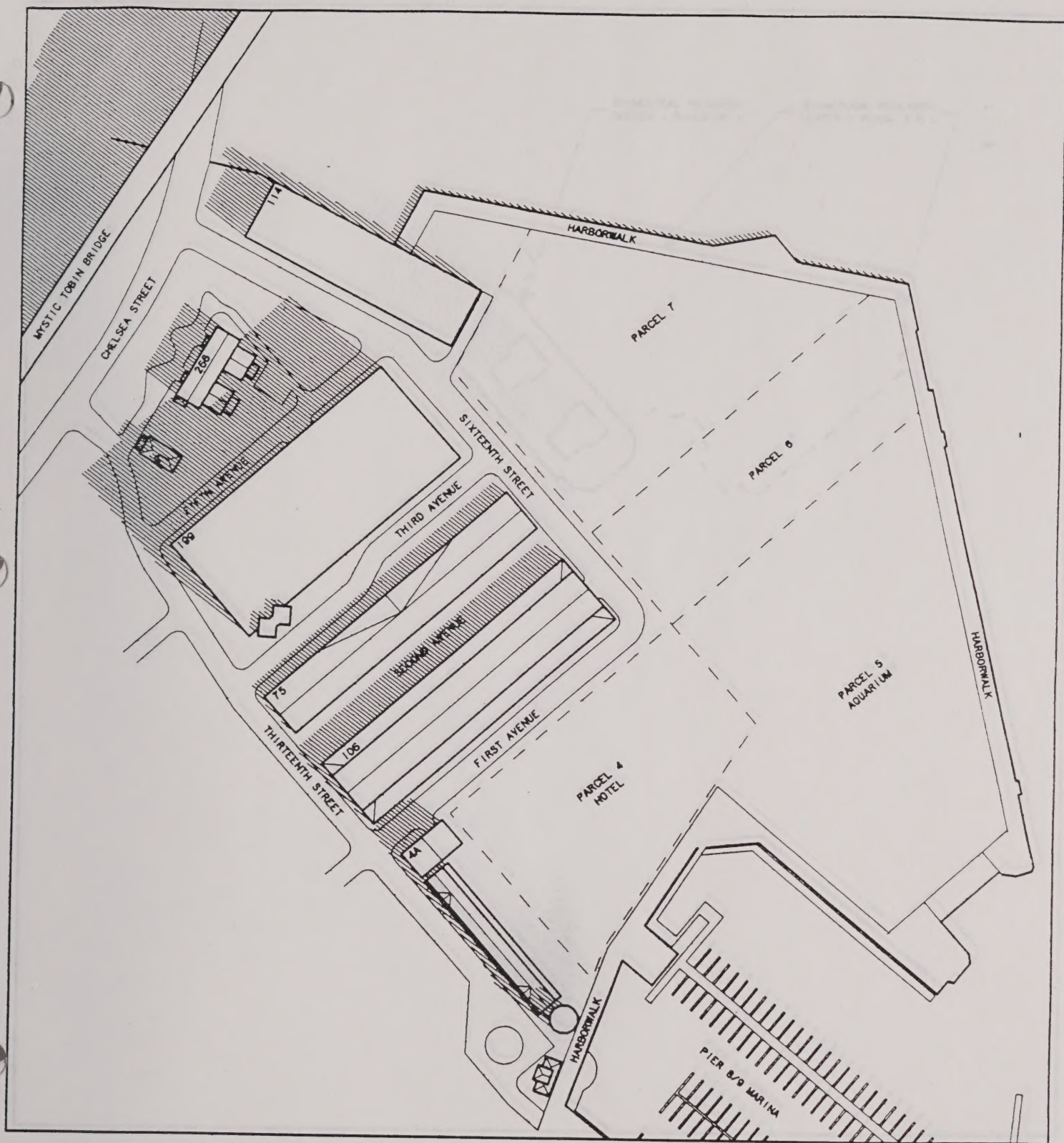


FIGURE: 1

EXISTING CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

MARCH 21, 9:00 AM
 BEARING: 127
 ALTITUDE: 33



EXISTING CONDITION
 SHADOWS

200 0 200
 IN FEET

PREPARED BY:
 SASAKI ASSOCIATES, INC.
 64 PLEASANT ST.
 WATERTOWN, MA. 02172
 1 AUGUST 1991

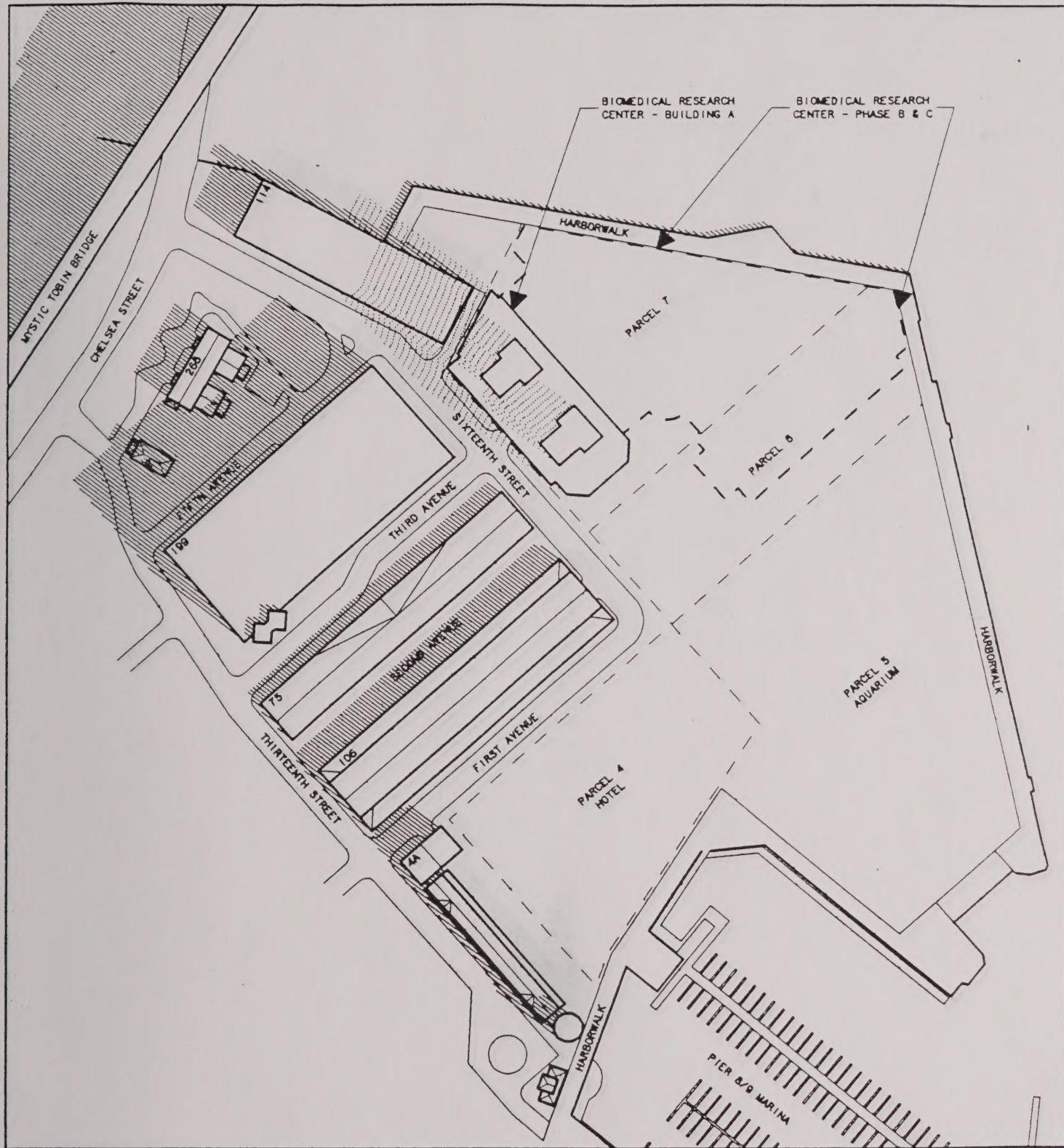
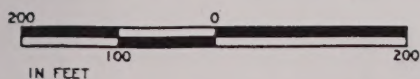
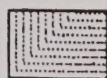


FIGURE: 2 PROPOSED CONDITIONS SHADOW ANALYSIS
 Charlestown Navy Yard
 Biomedical Research Center - Building A

MARCH 21, 9:00 AM
 BEARING: 127
 ALTITUDE: 33



EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
 (BIOMEDICAL RESEARCH
 CENTER - BUILDING 1)

PREPARED BY:
 SASAKI ASSOCIATES, INC.
 64 PLEASANT ST.
 WATERTOWN, MA. 02172
 1 AUGUST 1991

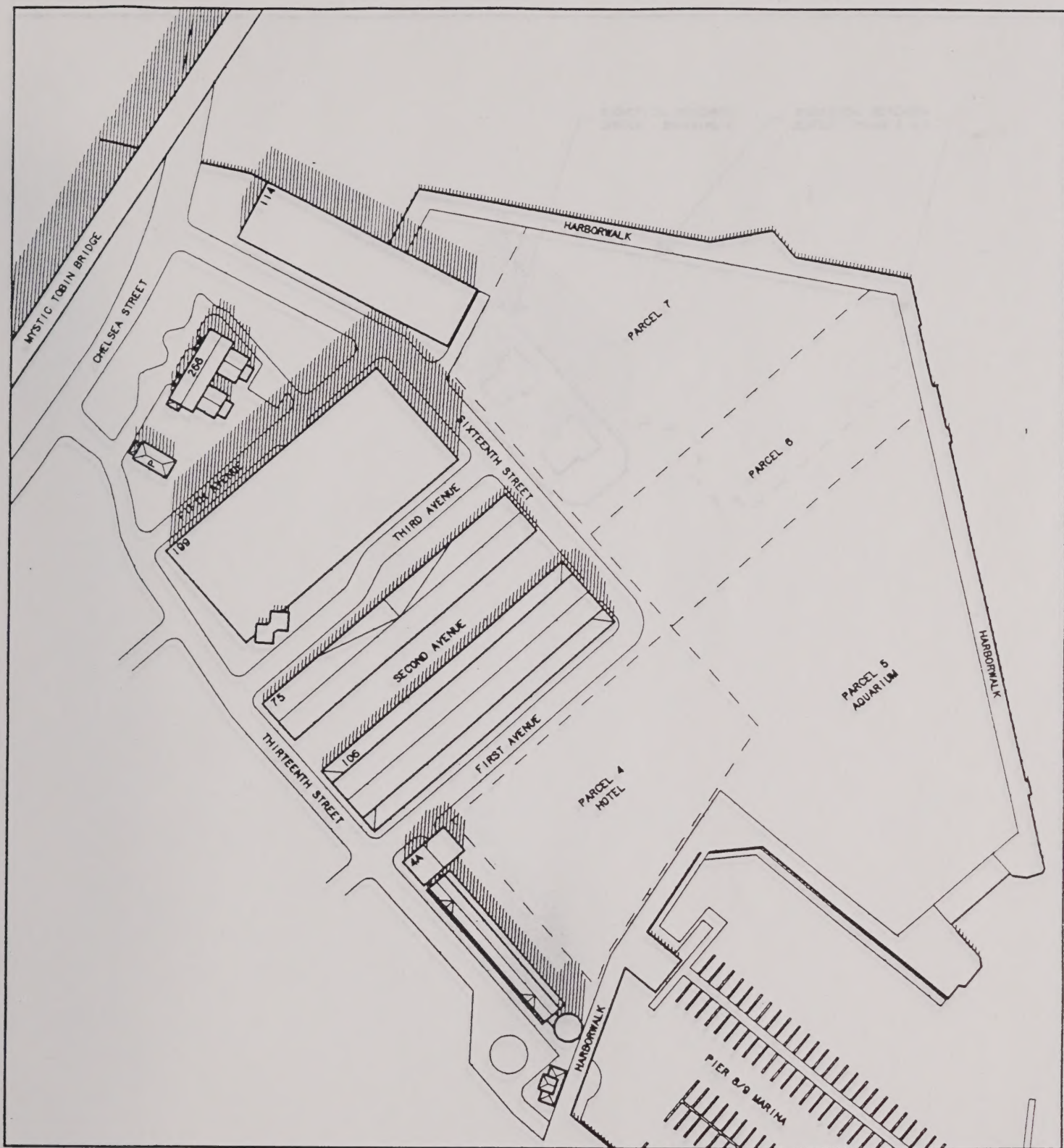


FIGURE: 3

EXISTING CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

MARCH 21, 12:00 PM
 BEARING: 184
 ALTITUDE: 48



EXISTING CONDITION
 SHADOWS

200 0 200
 IN FEET

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 SASAKI ASSOCIATES, INC.
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 WATERTOWN, MA. 02172
 1 AUGUST 1991

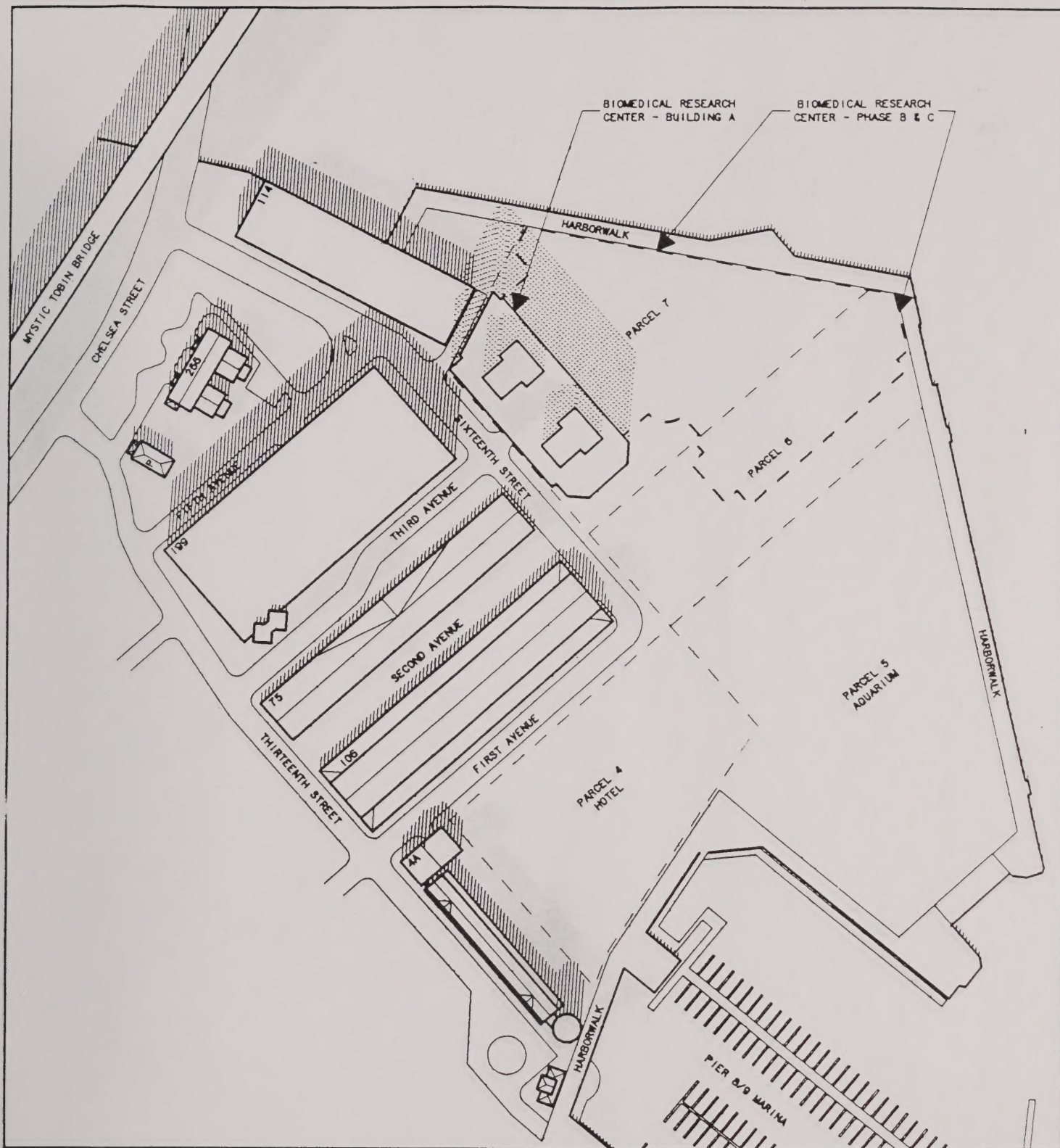
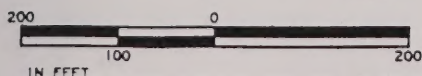


FIGURE: 4

PROPOSED CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

MARCH 21, 12:00 PM
 BEARING: 184
 ALTITUDE: 48



EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
 (BIOMEDICAL RESEARCH
 CENTER - BUILDING 1)

PREPARED BY:
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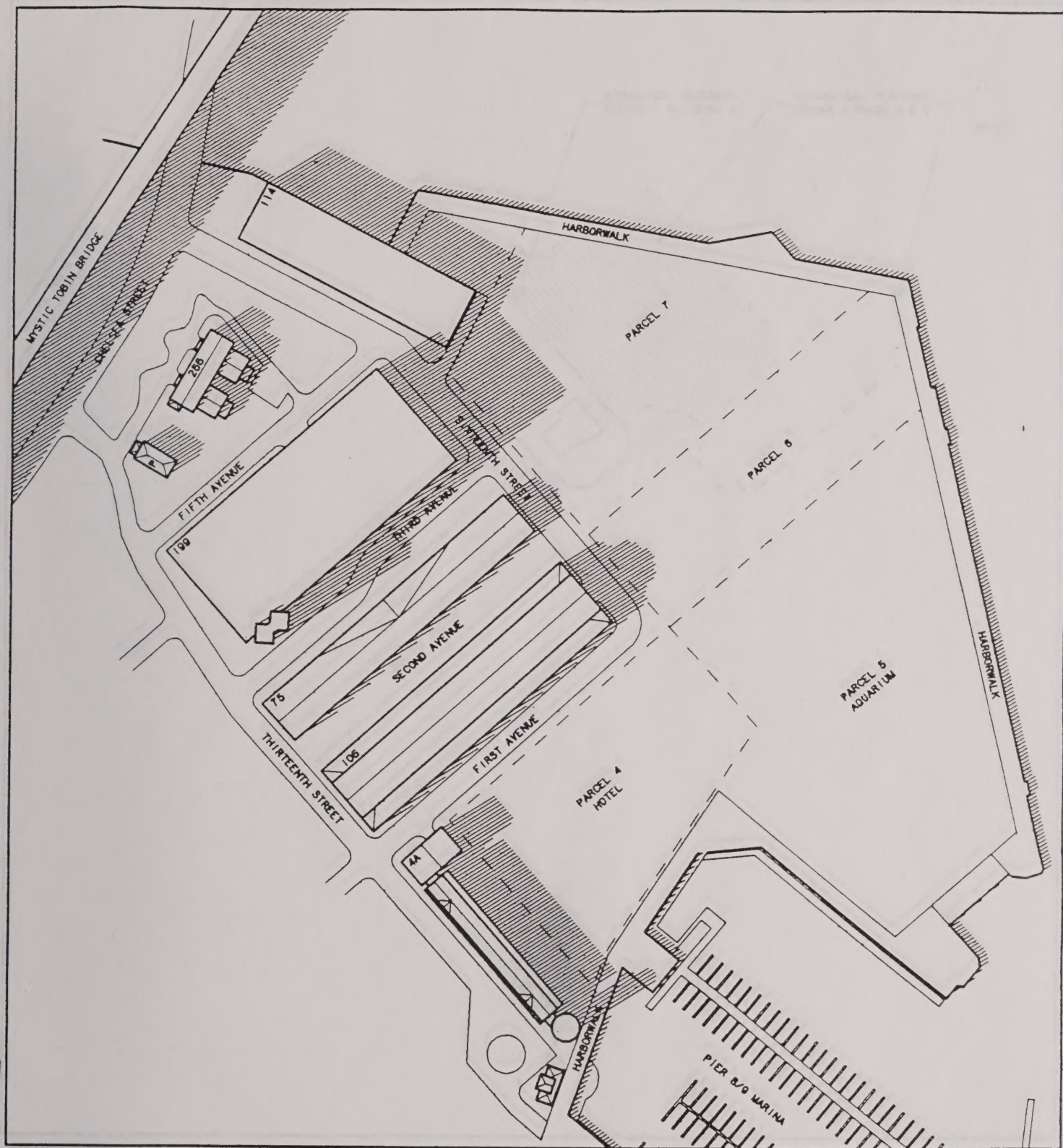


FIGURE: 5

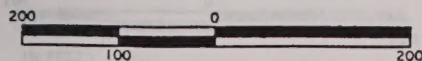
EXISTING CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

MARCH 21, 3:00 PM
 BEARING: 238
 ALTITUDE: 30



EXISTING CONDITION
 SHADOWS

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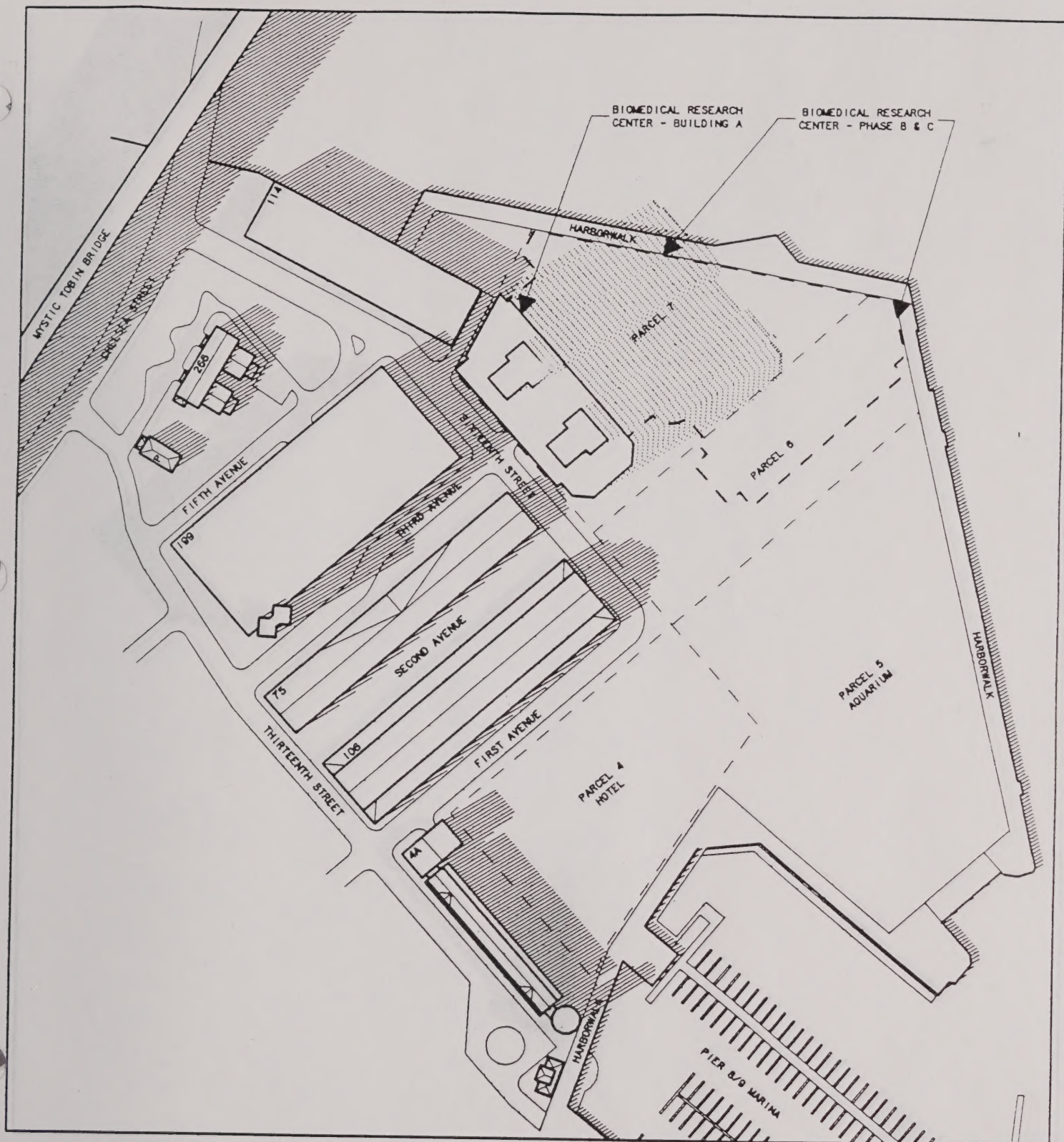


FIGURE: 6

PROPOSED CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

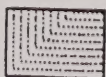
MARCH 21, 3:00 PM
 BEARING: 238
 ALTITUDE: 30



200 0 200
 IN FEET



EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
 (BIOMEDICAL RESEARCH
 CENTER - BUILDING 1)

PREPARED BY:
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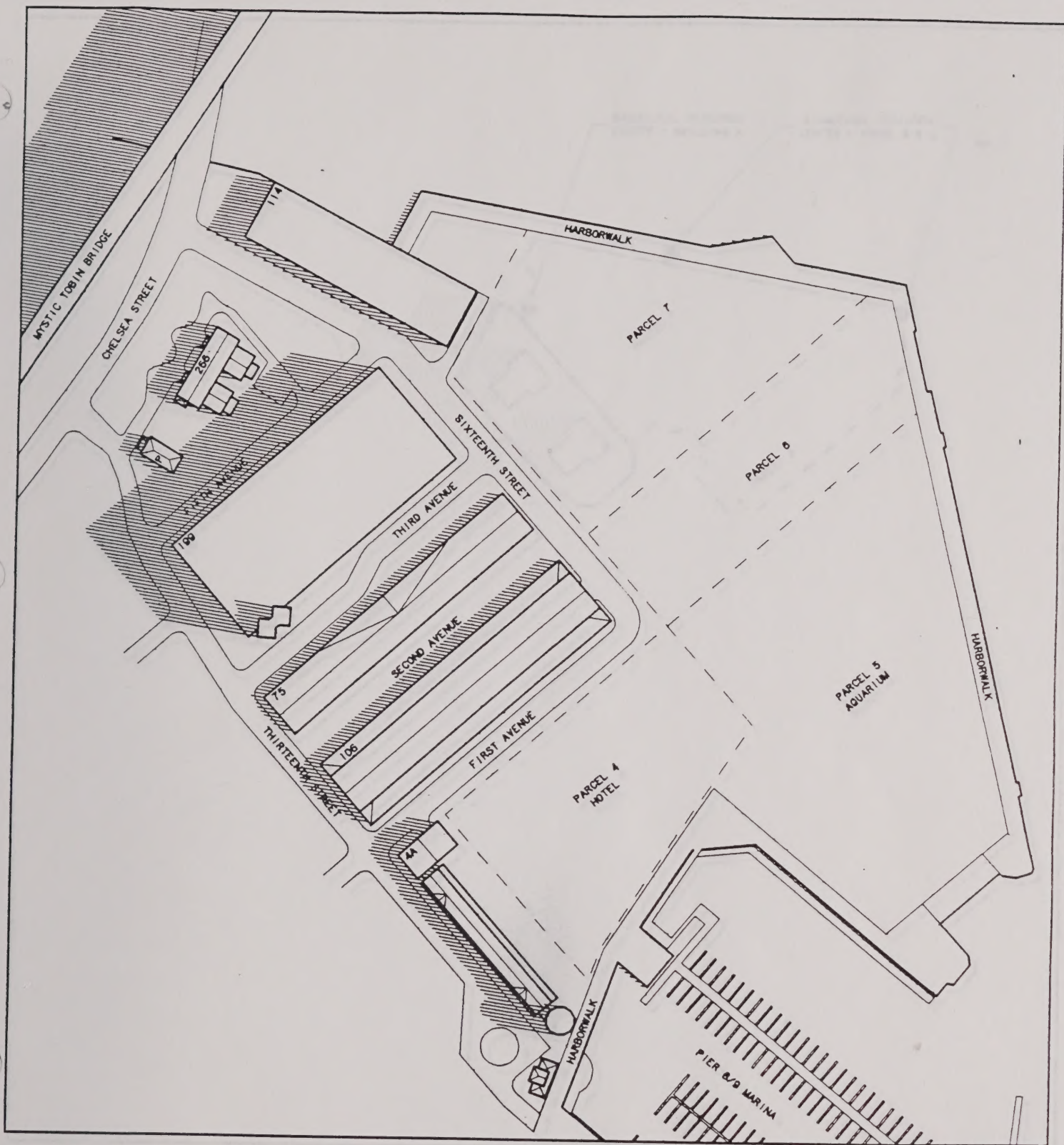


FIGURE: 7 EXISTING CONDITIONS SHADOW ANALYSIS
 Charlestown Navy Yard
 Biomedical Research Center - Building A

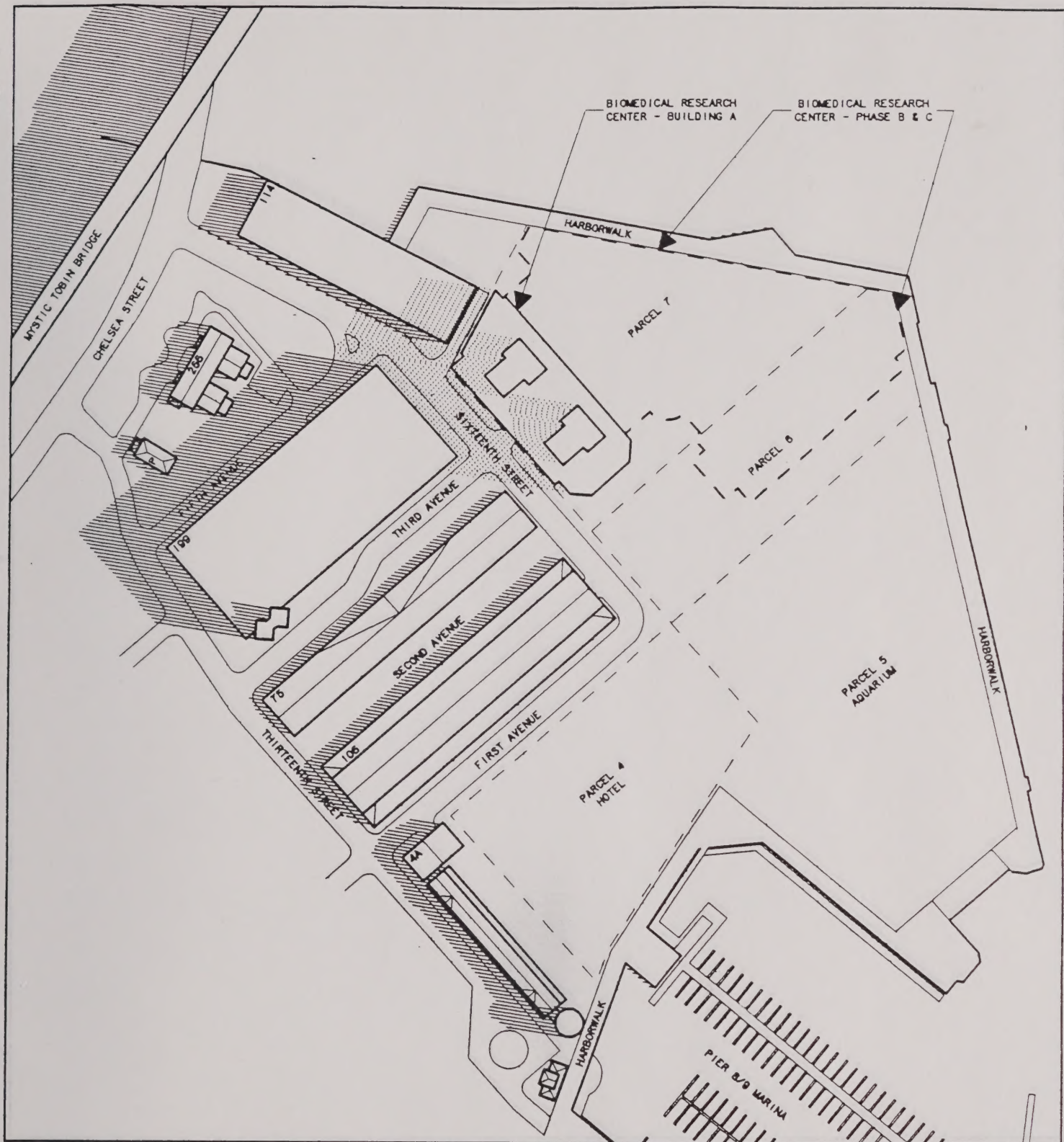
JUNE 21, 9:00 AM
 BEARING: 99
 ALTITUDE: 40



EXISTING CONDITION
 SHADOWS

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 1 AUGUST 1991

200 0 200
 100
 IN FEET



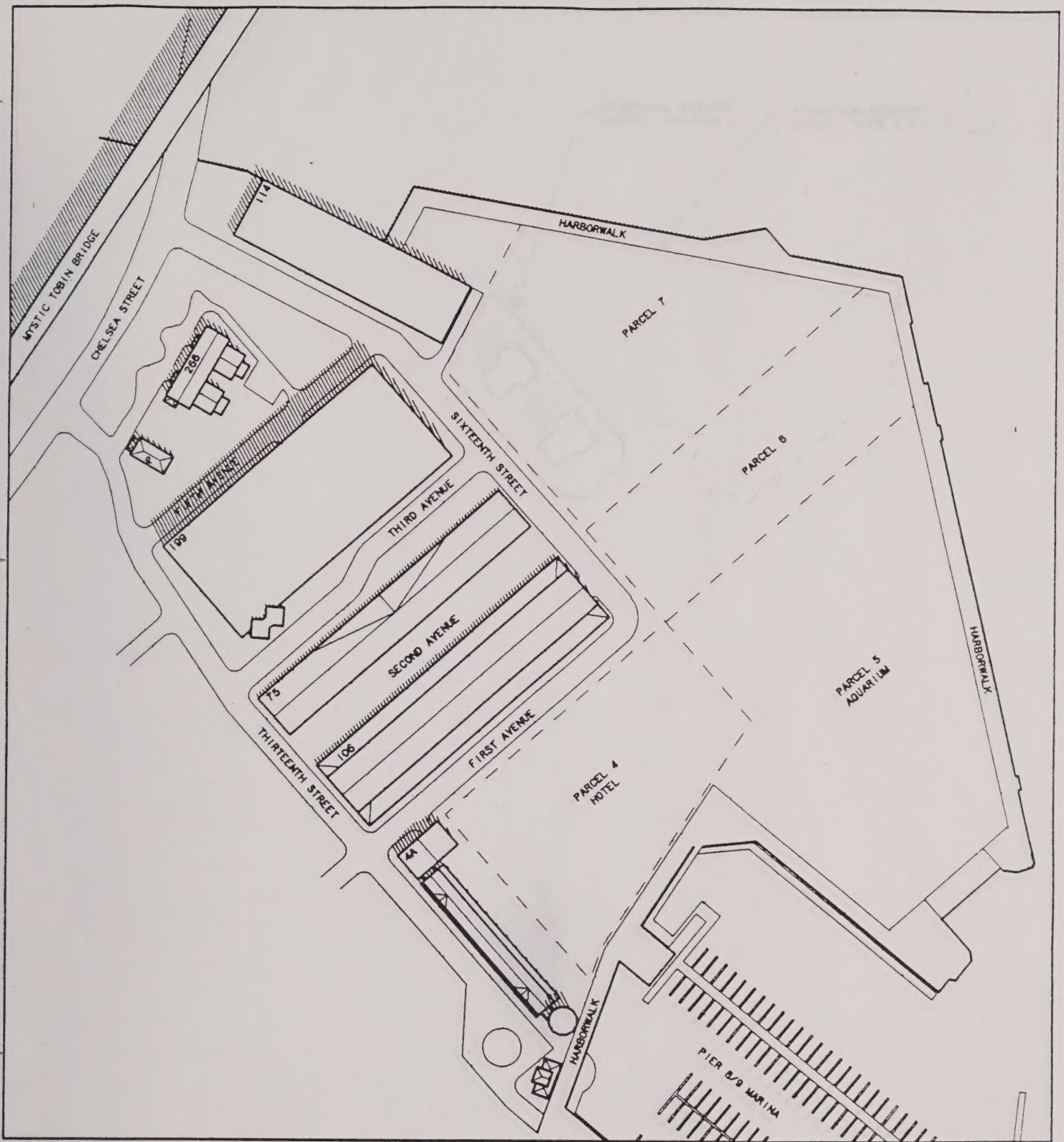


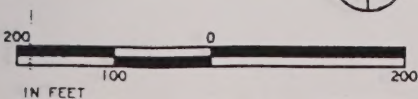
FIGURE: 9

EXISTING CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

JUNE 21, 12:00 PM
 BEARING: 152
 ALTITUDE: 69



EXISTING CONDITION
 SHADOWS



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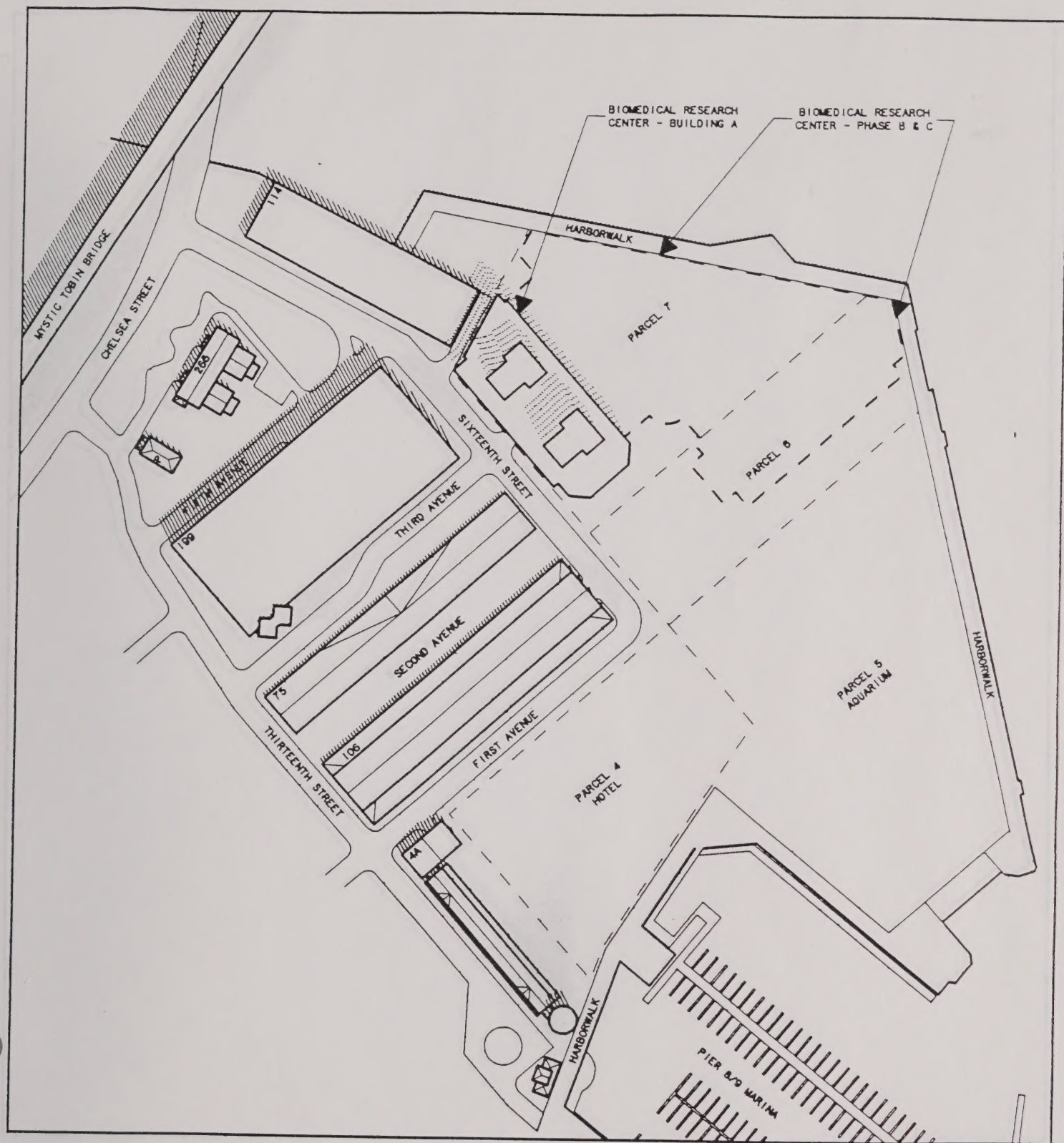
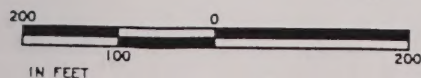


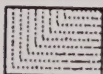
FIGURE: 10

PROPOSED CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

JUNE 21, 12:00 PM
 BEARING: 152
 ALTITUDE: 69



EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
 (BIOMEDICAL RESEARCH
 CENTER - BUILDING 1)

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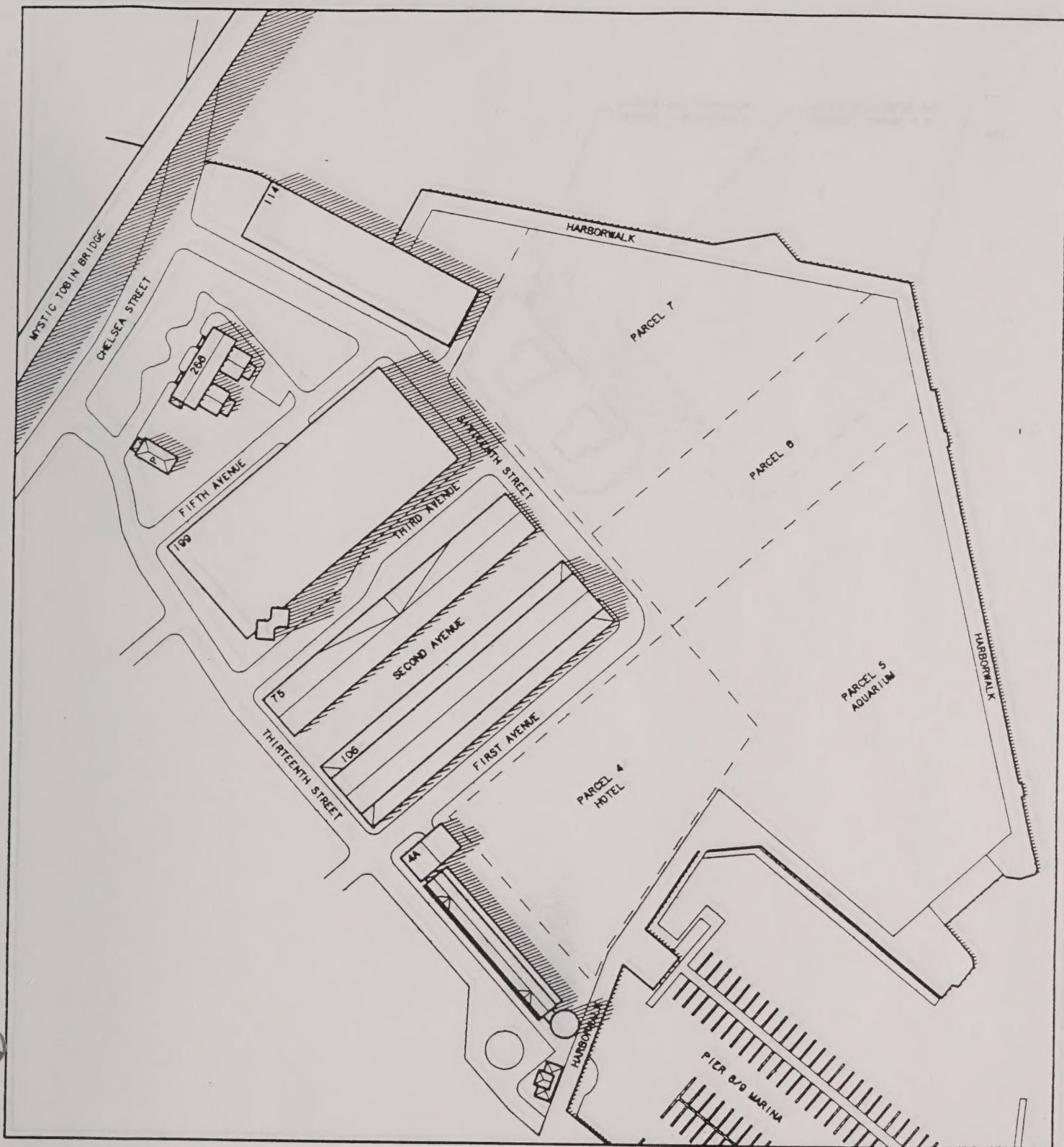


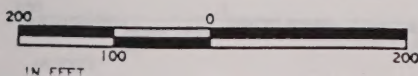
FIGURE: 11 EXISTING CONDITIONS SHADOW ANALYSIS
 Charlestown Navy Yard
 Biomedical Research Center - Building A

JUNE 21, 3:00 PM
 BEARING: 248
 ALTITUDE: 56



EXISTING CONDITION
 SHADOWS

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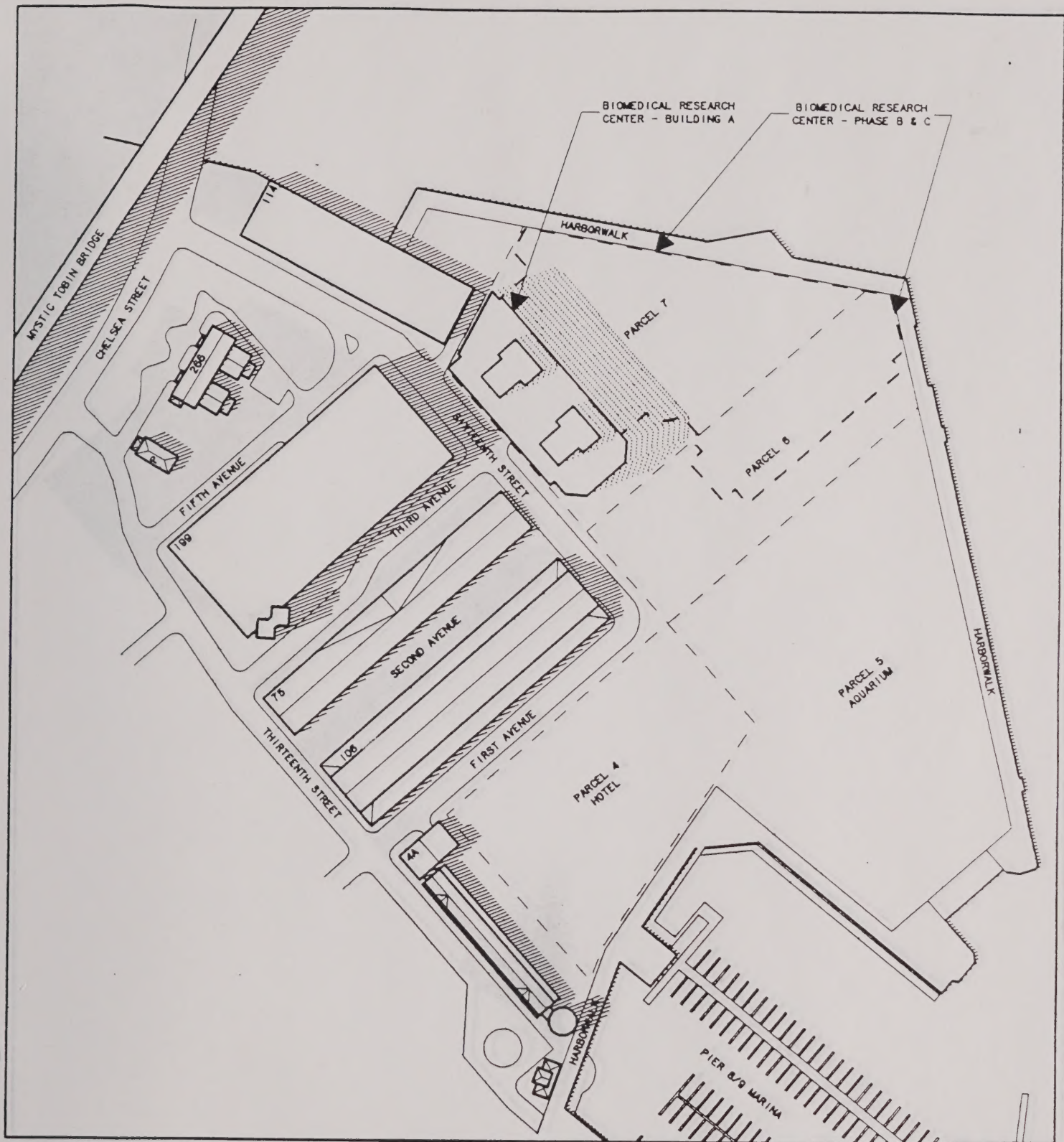


FIGURE: 12

PROPOSED CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

JUNE 21, 3:00 PM
 BEARING: 248
 ALTITUDE: 56

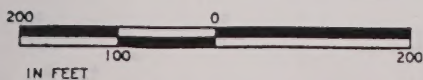


EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
 (BIOMEDICAL RESEARCH
 CENTER - BUILDING 1)

PREPARED BY:
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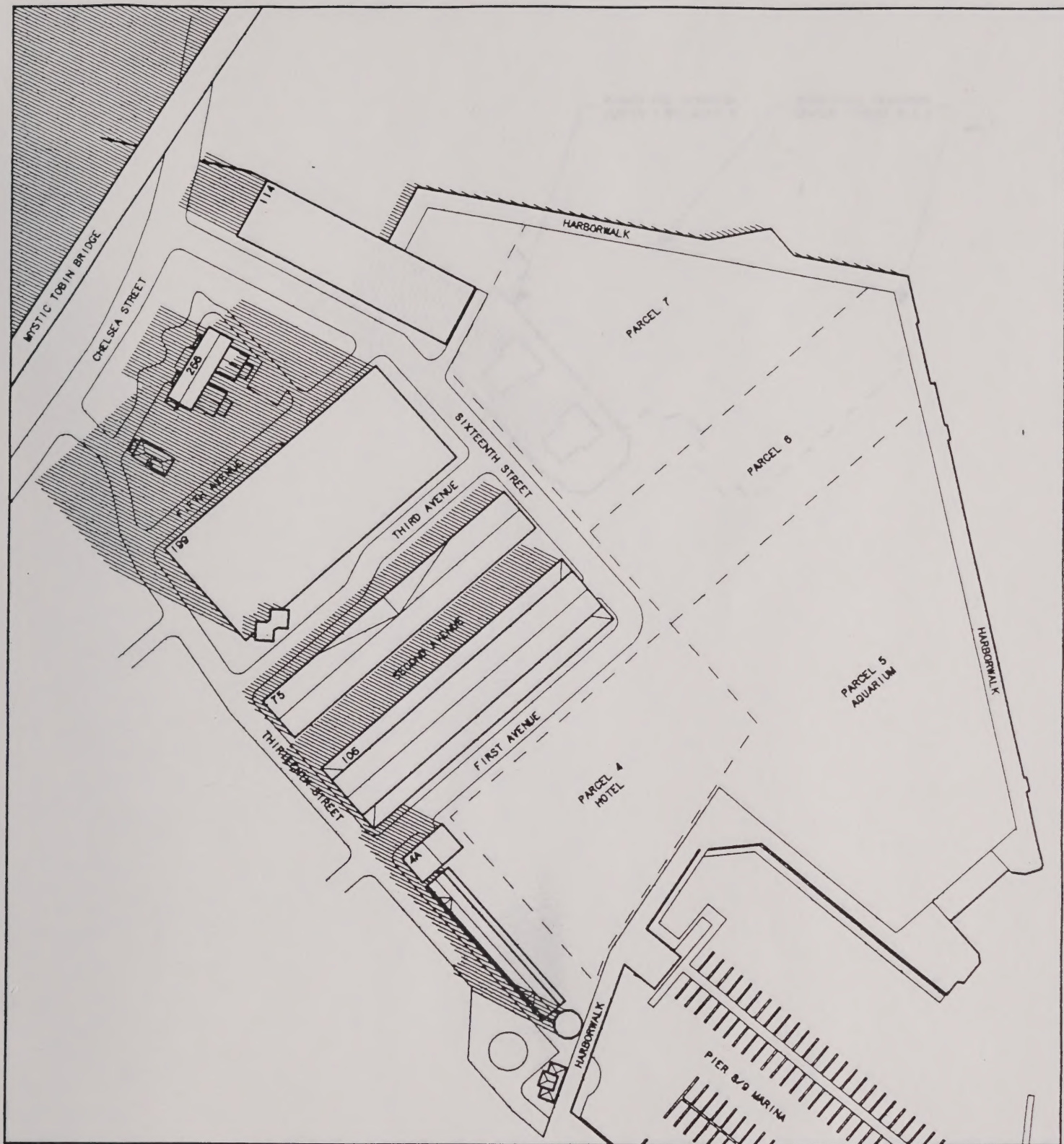


FIGURE: 13

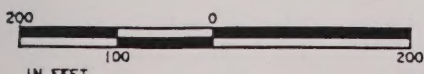
EXISTING CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

SEPTEMBER 21, 9:00 AM
 BEARING: 117
 ALTITUDE: 27



EXISTING CONDITION
 SHADOWS

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 1 AUGUST 1991



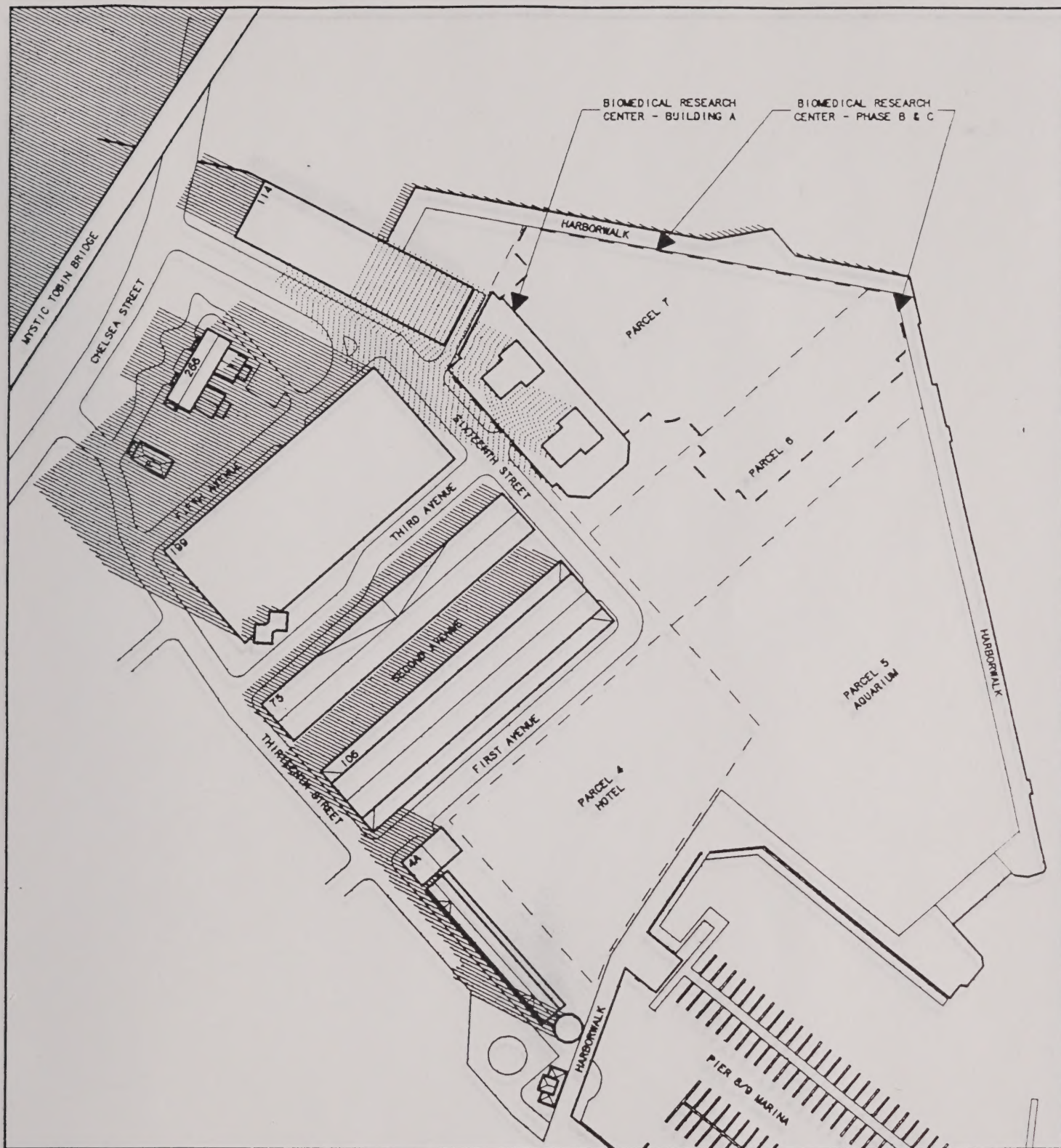


FIGURE: 14 PROPOSED CONDITIONS SHADOW ANALYSIS
 Charlestown Navy Yard
 Biomedical Research Center - Building A

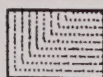
SEPTEMBER 21, 9:00 AM
 BEARING: 117
 ALTITUDE: 27



200 0 200
 IN FEET



EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
 (BIOMEDICAL RESEARCH
 CENTER - BUILDING A)

PREPARED BY:
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 1 AUGUST 1991

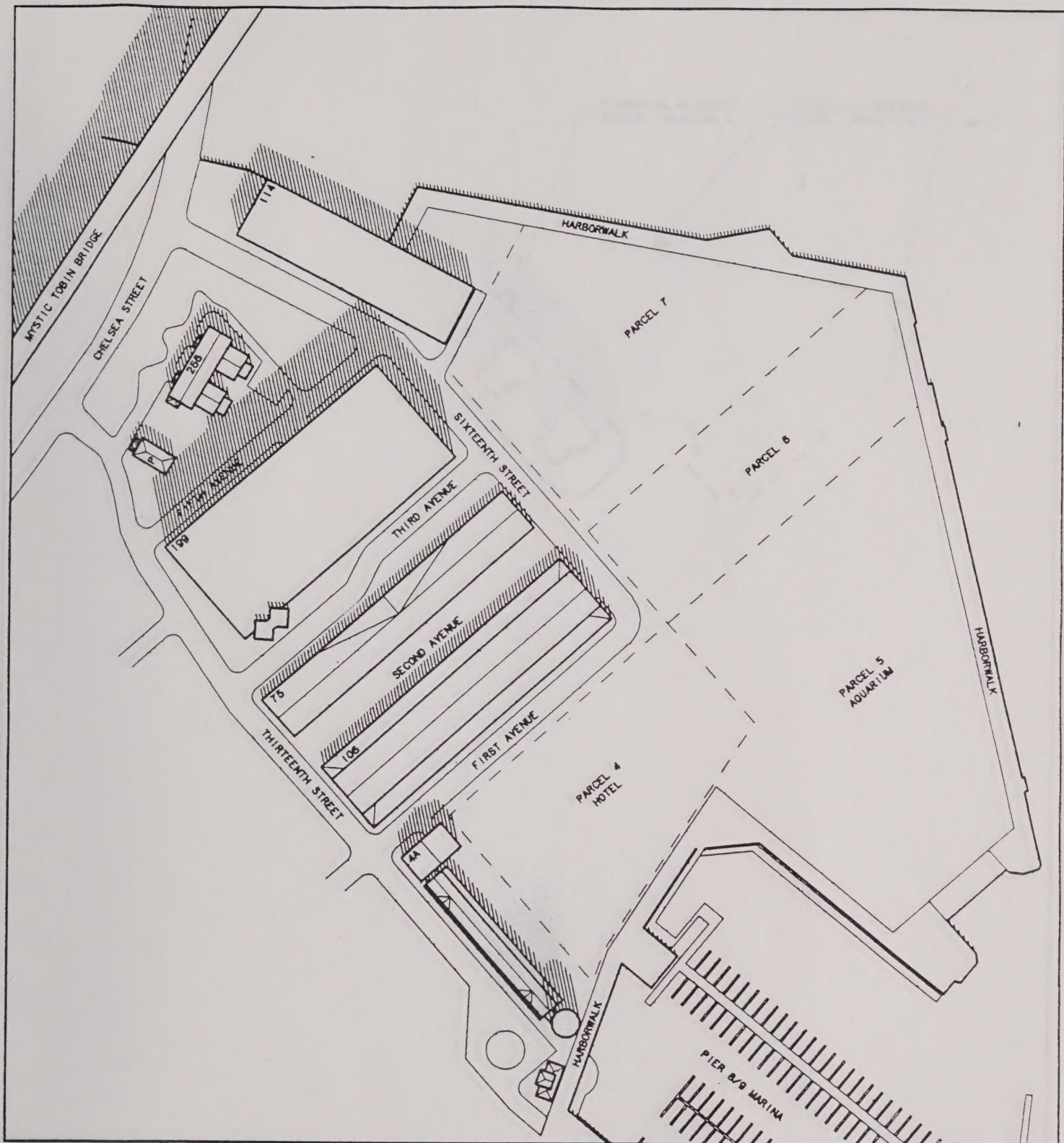
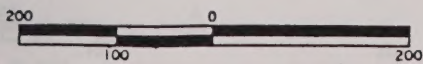


FIGURE: 15 EXISTING CONDITIONS SHADOW ANALYSIS
 Charlestown Navy Yard
 Biomedical Research Center – Building A

SEPTEMBER 21, 12:00 PM
 BEARING: 168
 ALTITUDE: 47



EXISTING CONDITION
 SHADOWS



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 1 AUGUST 1991

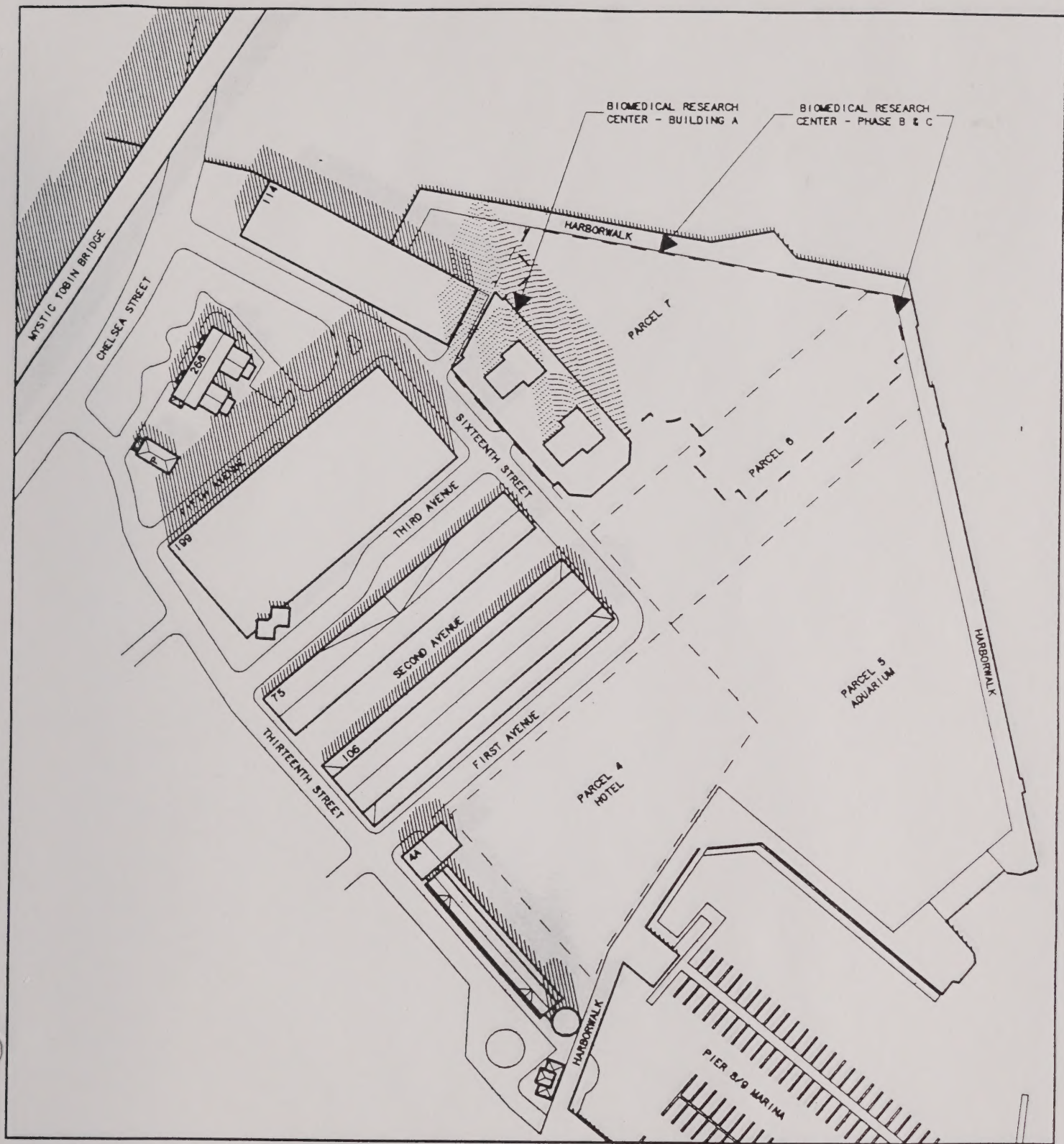


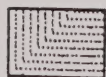
FIGURE: 16

PROPOSED CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

SEPTEMBER 21, 12:00 PM
 BEARING: 168
 ALTITUDE: 47



EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
 (BIOMEDICAL RESEARCH
 CENTER - BUILDING 1)

200 0 200
 IN FEET

PREPARED BY:
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 WATERTOWN, MA. 02172
 1 AUGUST 1991

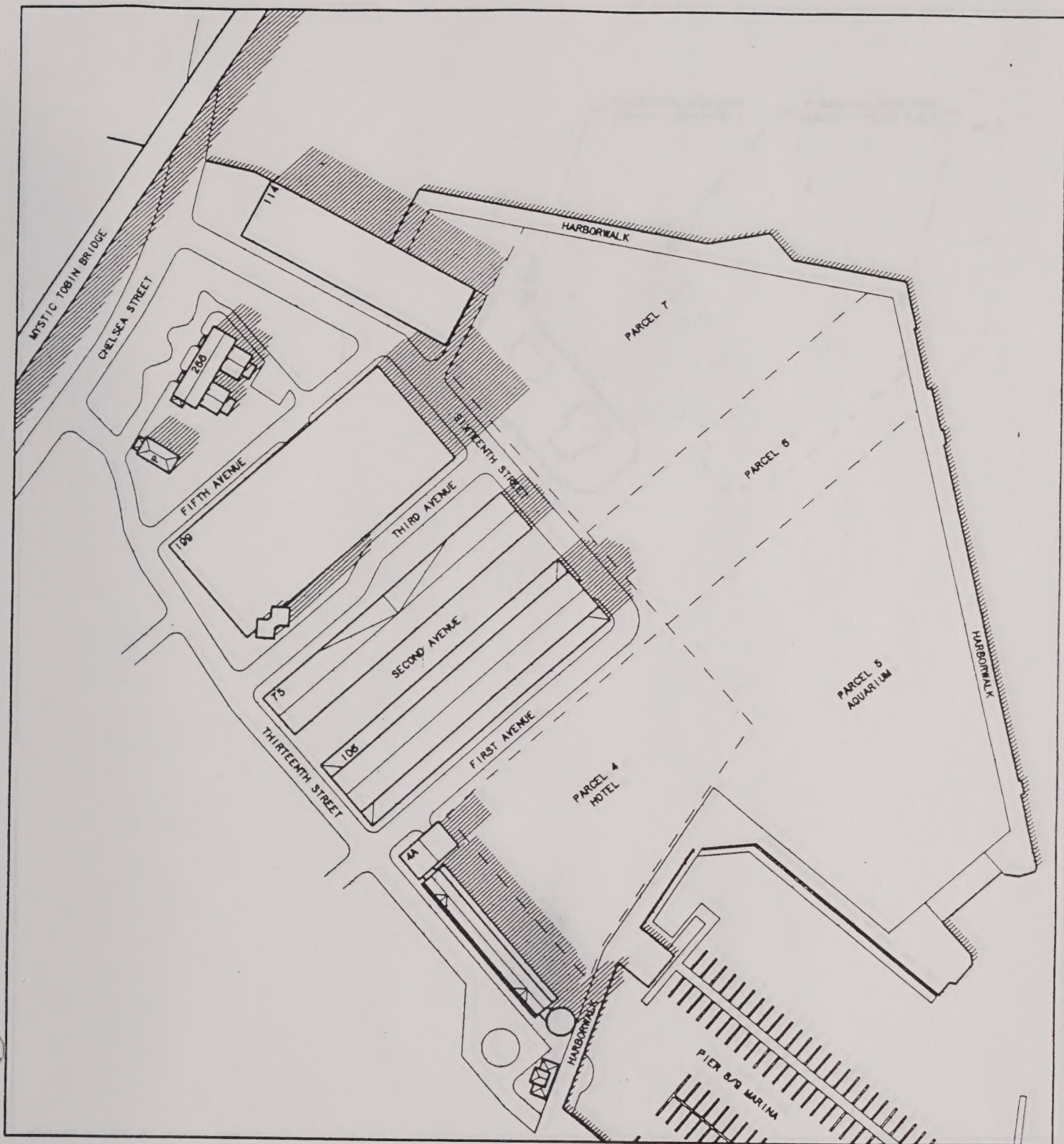


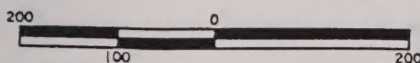
FIGURE: 17

EXISTING CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

SEPTEMBER 21, 3:00 PM
 BEARING: 227
 ALTITUDE: 37



EXISTING CONDITION
 SHADOWS



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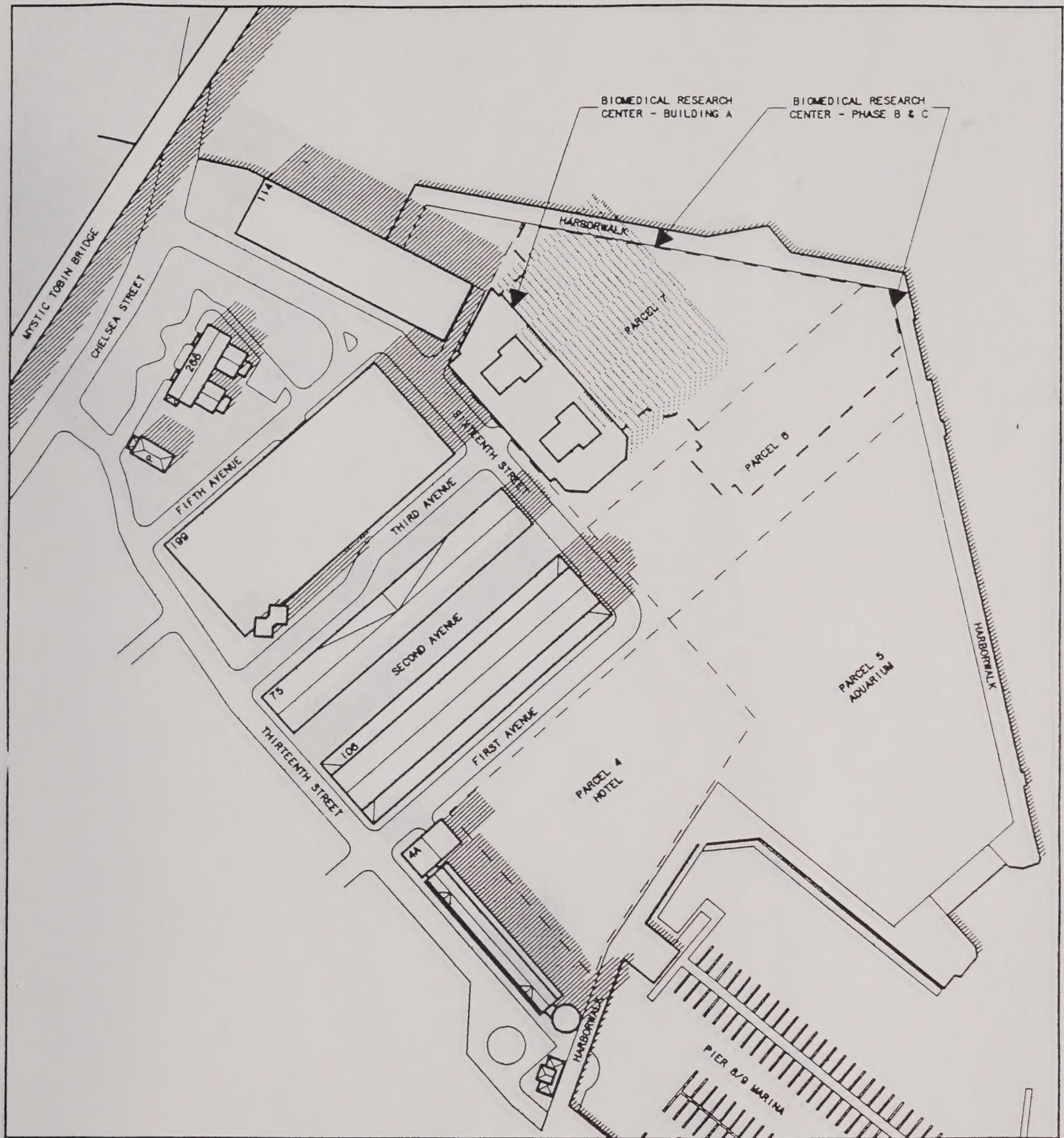
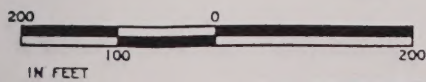
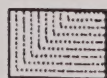


FIGURE: 18 PROPOSED CONDITIONS SHADOW ANALYSIS
 Charlestown Navy Yard
 Biomedical Research Center - Building A

SEPTEMBER 21, 3:00 PM
 BEARING: 227
 ALTITUDE: 37



EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
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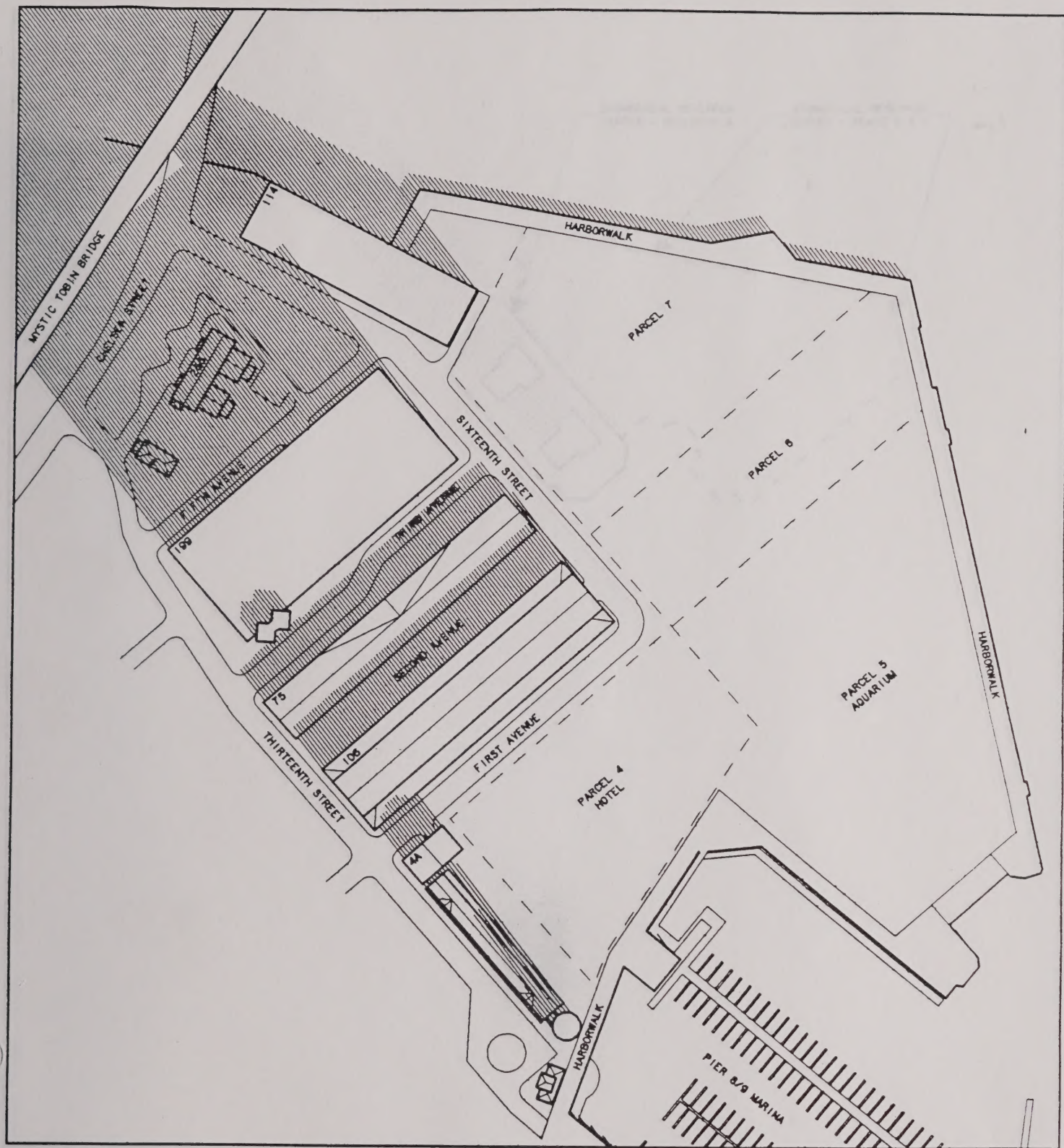


FIGURE: 19 EXISTING CONDITIONS SHADOW ANALYSIS
 Charlestown Navy Yard
 Biomedical Research Center - Building A

DECEMBER 21, 9:00 AM
 BEARING: 142
 ALTITUDE: 15



EXISTING CONDITION
 SHADOWS

200 0 200
 IN FEET

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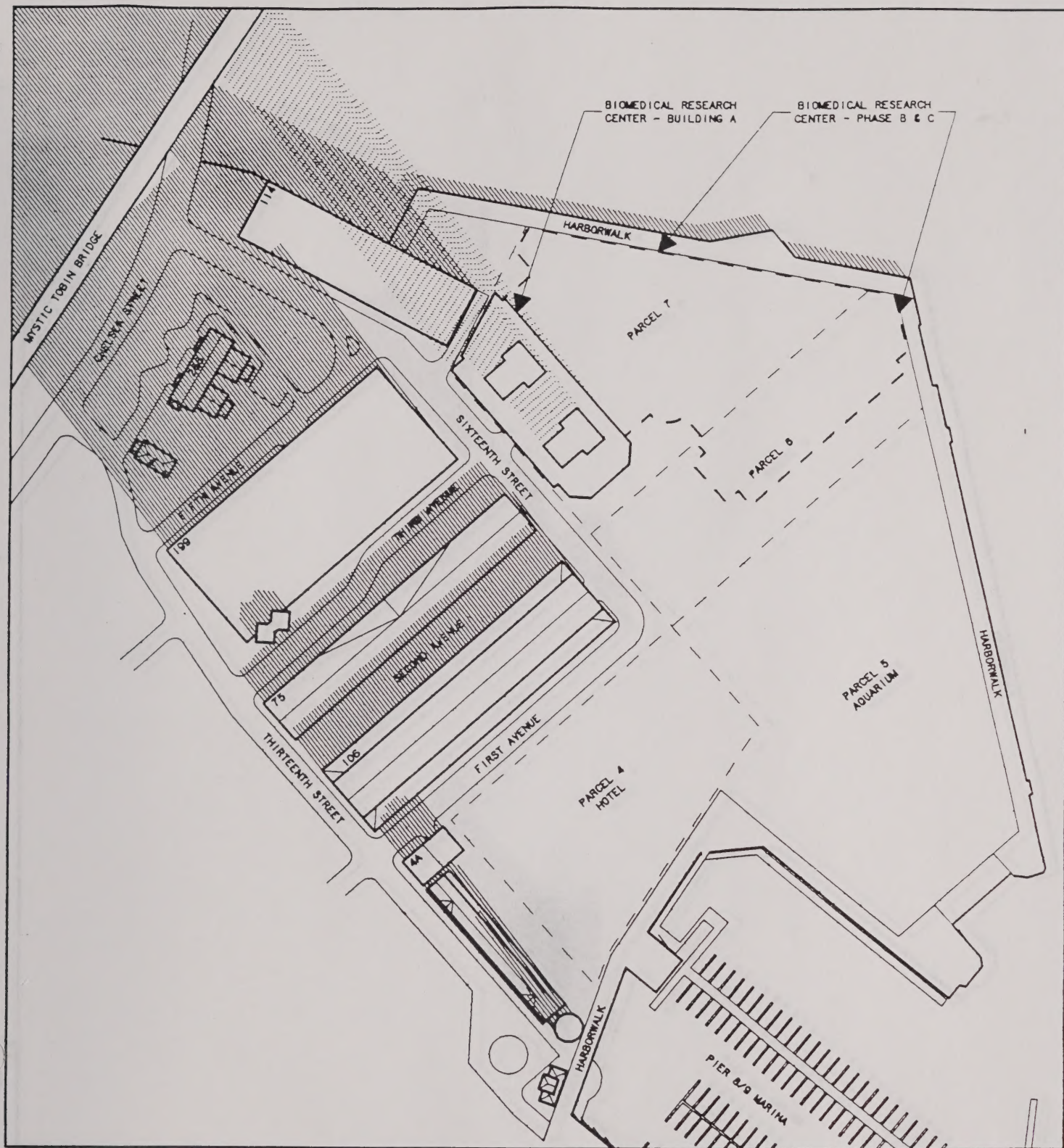


FIGURE: 20

PROPOSED CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

DECEMBER 21, 9:00 AM
 BEARING: 142
 ALTITUDE: 15



200 0 200
 IN FEET



EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
 (BIOMEDICAL RESEARCH
 CENTER - BUILDING 1)

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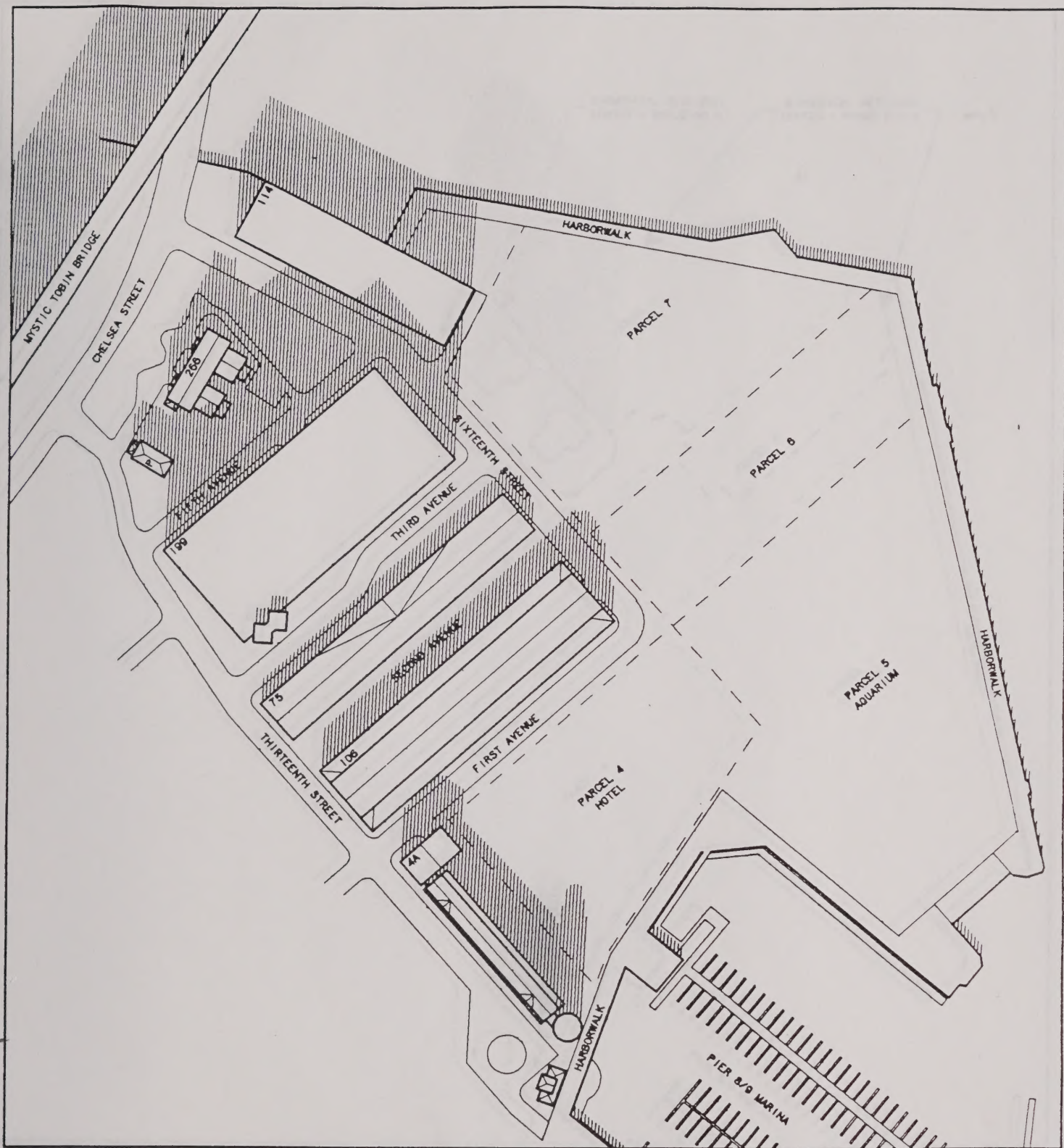
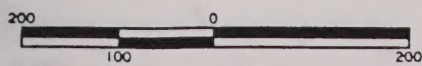


FIGURE: 21 EXISTING CONDITIONS SHADOW ANALYSIS
 Charlestown Navy Yard
 Biomedical Research Center - Building A

DECEMBER 21, 12:00 PM
 BEARING: 183
 ALTITUDE: 25



EXISTING CONDITION
 SHADOWS



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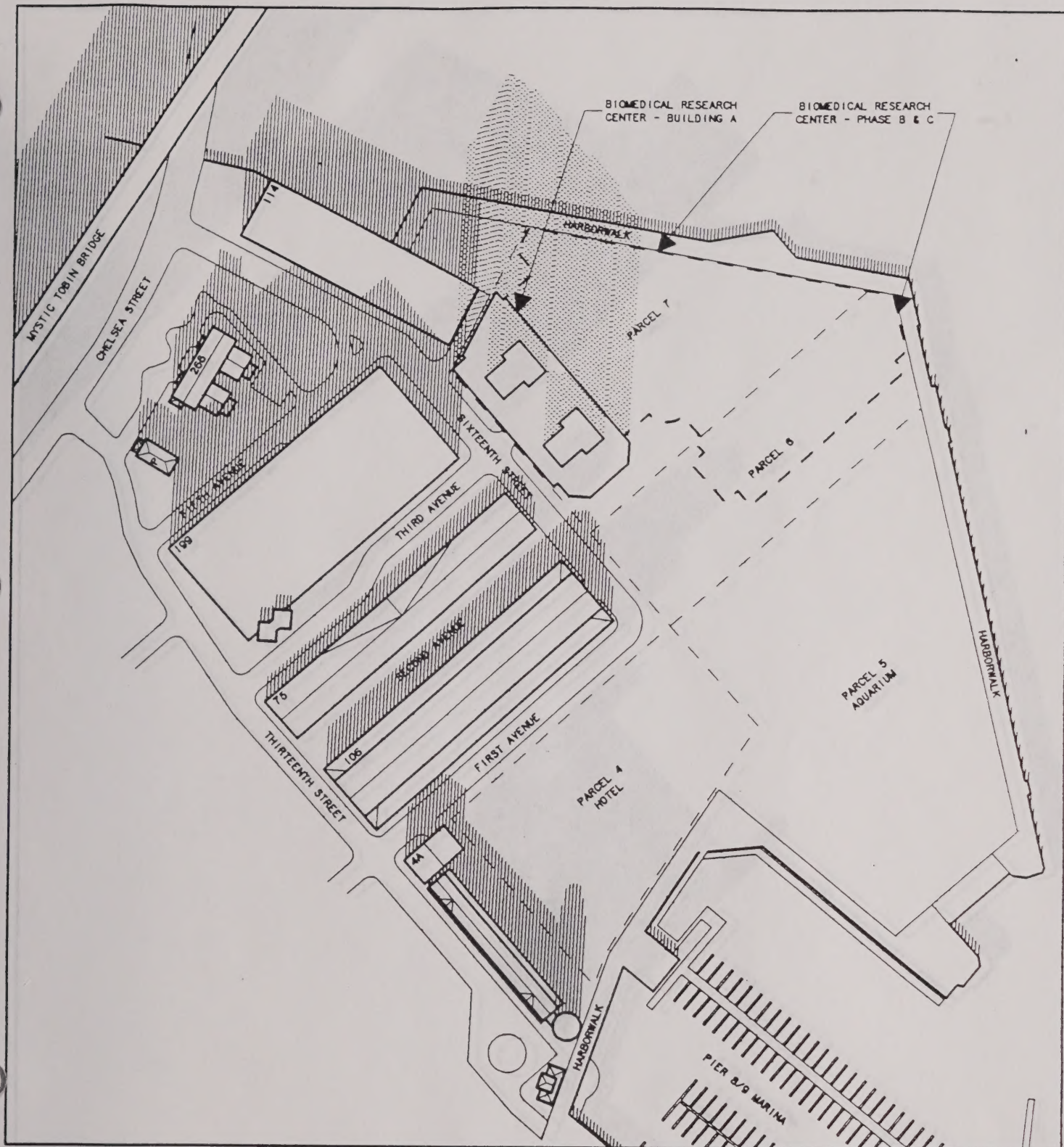


FIGURE: 22 PROPOSED CONDITIONS SHADOW ANALYSIS
 Charlestown Navy Yard
 Biomedical Research Center - Building A

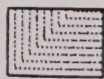
DECEMBER 21, 12:00 PM
 BEARING: 183
 ALTITUDE: 25



200 0 200
 IN FEET



EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
 (BIOMEDICAL RESEARCH
 CENTER - BUILDING 1)

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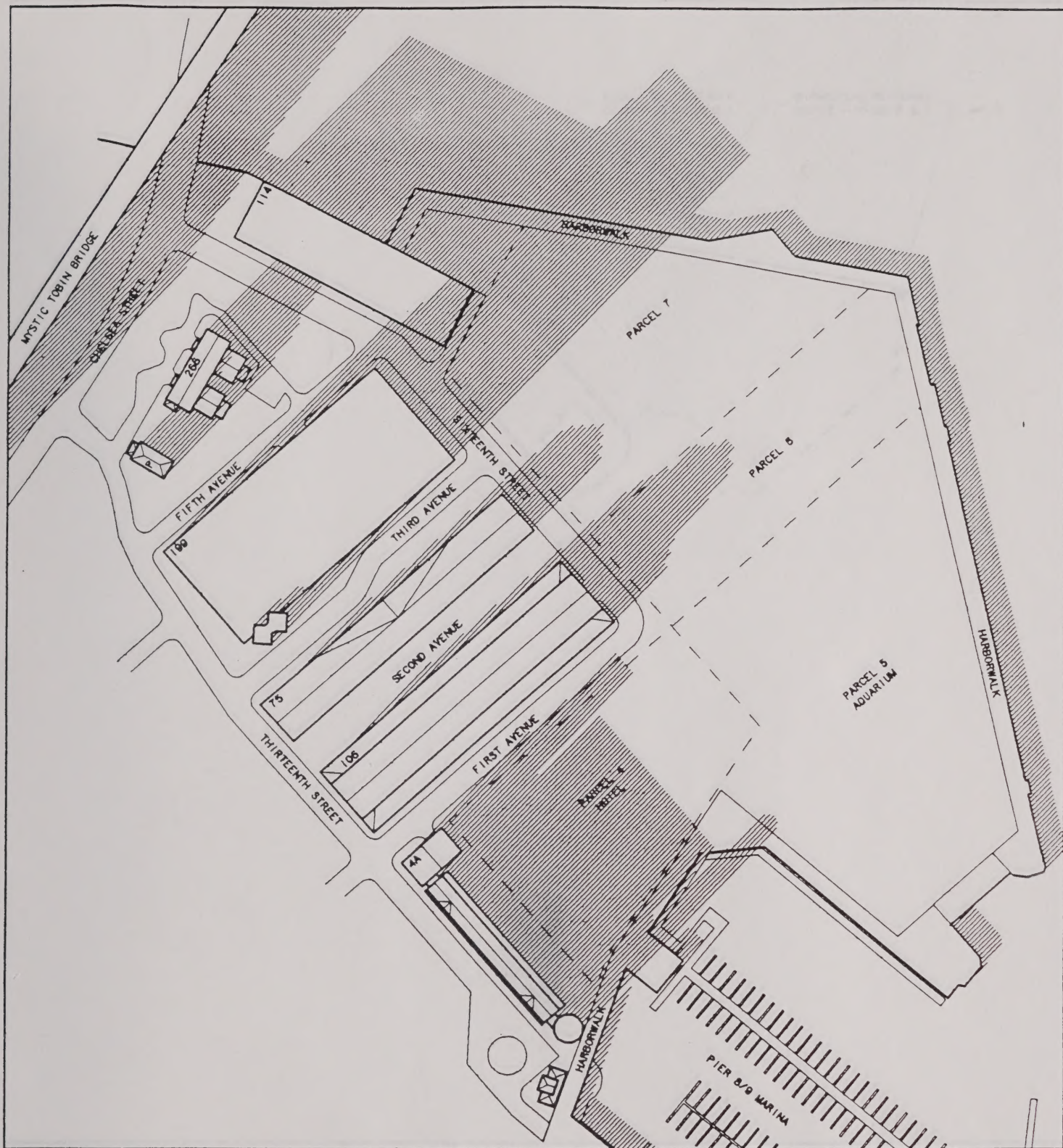


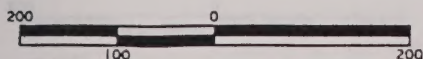
FIGURE: 23

EXISTING CONDITIONS SHADOW ANALYSIS
 Charlestown Navy Yard
 Biomedical Research Center - Building A

DECEMBER 21, 3:00 PM
 BEARING: 224
 ALTITUDE: 11



EXISTING CONDITION
 SHADOWS



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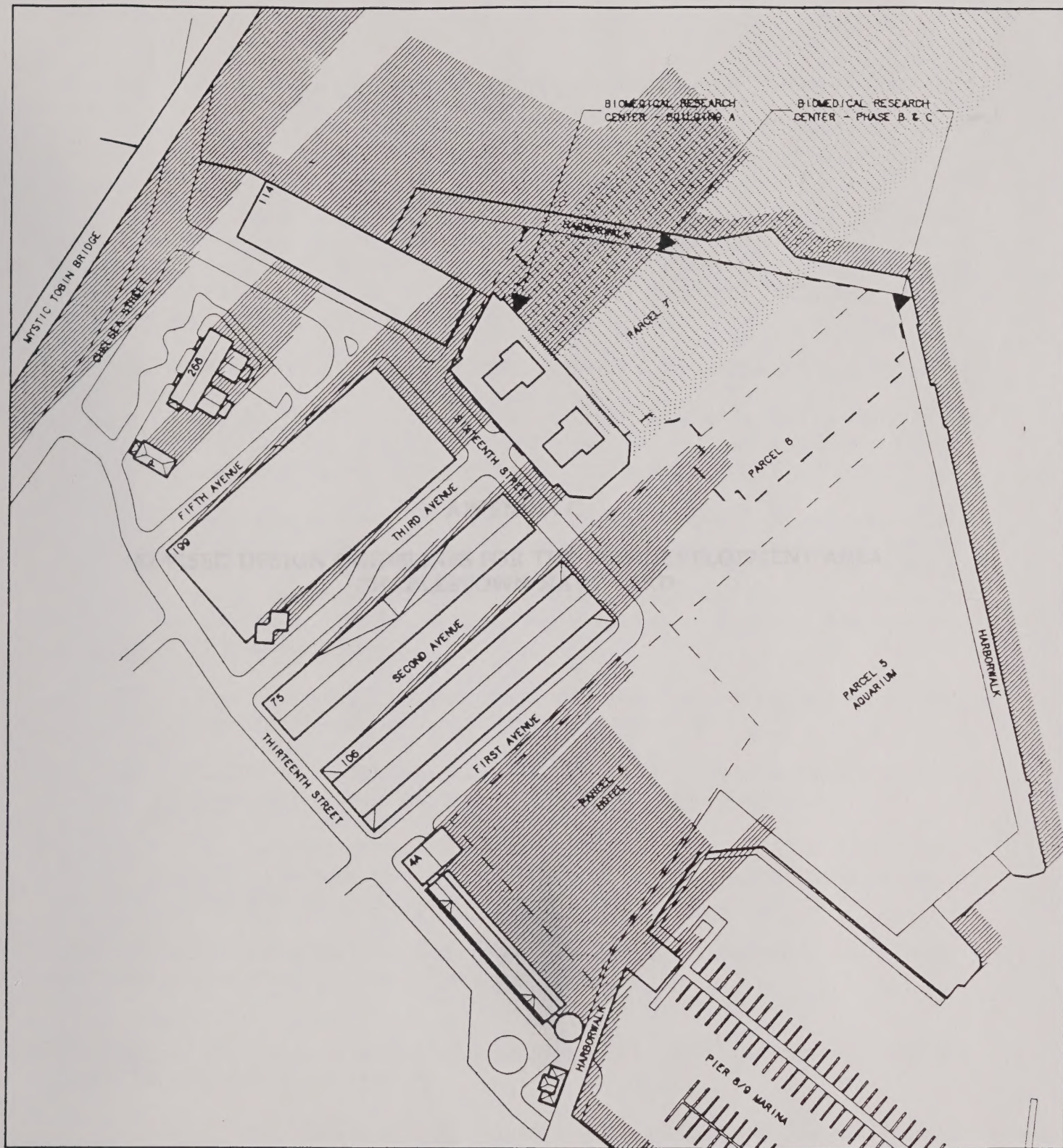
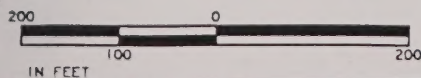


FIGURE: 24

PROPOSED CONDITIONS SHADOW ANALYSIS Charlestown Navy Yard Biomedical Research Center - Building A

DECEMBER 21, 3:00 PM
 BEARING: 224
 ALTITUDE: 11



EXISTING CONDITION
 SHADOWS



NET NEW SHADOWS
 (BIOMEDICAL RESEARCH
 CENTER - BUILDING 1)

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 1 AUGUST 1991

AMENDMENT TO DESIGN GUIDELINES
FOR THE NEW DEVELOPMENT AREA,
CHARLESTOWN NAVY YARD

This Amendment to Design Guidelines for the New Development Area, Charlestown Navy Yard ("Amendment") is made as of the 11th day of July, 1995, by and among the Massachusetts State Historic Preservation Office ("SHPO"), the Advisory Council on Historic Preservation ("ACHP"), and the Boston Redevelopment Authority ("BRA") (collectively, the "Parties").

The following facts and representations are pertinent to the making of this Amendment:

- A. On May 21, 1975, the "Design Guidelines for the New Development Area, Charlestown Navy Yard" ("Guidelines") were adopted by the BRA as a part of the Charlestown Navy Yard, which portion is commonly referred to as the "New Development Area" or "New Yard".

APPENDIX C

REVISED DESIGN GUIDELINES FOR THE NEW DEVELOPMENT AREA,
CHARLESTOWN NAVY YARD

- C. Since the original adoption of the Guidelines, the New Development Area has been significantly redeveloped in accordance with the Design Guidelines.

- D. On October 15, 1995, the Board of the BRA adopted a new master plan ("Master Plan") for the Yard's East portion of the Charlestown Navy Yard.

- E. In order to permit implementation of the Yard's East Master Plan in accordance with the terms of the Guidelines, it is the desire of the Parties to amend the Design Guidelines as set forth herein.

NOW THEREFORE, in consideration of the mutual promises and agreements herein contained, the Parties agree to amend the Design Guidelines as follows:

1. **Definitions.** For the purposes of this Amendment and the Guidelines, the following terms and phrases have the meanings ascribed:

"Building Height" shall mean, including mechanical roof structures, penthouses, masts, spires, towers and other structures, the maximum height of a building measured from the ground to the top of the highest point of the roof plane. If the building has a pitched roof, the vertical distance from grade to the lowest of all the main levels of the roof plane shall be the height of the building. If the building has a flat roof, the height shall be the height of the structure at the highest occupied level. The flat roof grade shall be measured from the top of the deck of the flat.

AMENDMENT TO DESIGN GUIDELINES
FOR THE NEW DEVELOPMENT AREA,
CHARLESTOWN NAVY YARD

This Amendment to Design Guidelines for the New Development Area, Charlestown Navy Yard ("Amendment") is made as of this 19th day of July, 1991, by and among the Massachusetts State Historic Preservation Officer ("MSHPO"), the Advisory Council on Historic Preservation ("ACHP"), and the Boston Redevelopment Authority ("BRA") (collectively hereinafter the "Parties").

The following facts and circumstances are pertinent to the making of this Amendment:

- A. On May 21, 1979, the General Services Administration ("GSA") conveyed to the BRA a 58.4 acre portion of the Charlestown Navy Yard, which portion is commonly referred to as the "New Development Area" or "Buy Parcel."
- B. Said conveyance was made subject to a Memorandum Of Agreement ("MOA") executed in June of 1978, by and among the GSA, ACHP, and MSHPO, with the concurrence of the BRA. Among other things, the MOA established certain design guidelines, dated June 1978 ("Design Guidelines"), to which subsequent restoration, rehabilitation, demolition, and new construction activities were required to conform.
- C. Since the original conveyance, the New Development Area has been substantially redeveloped in accordance with the Design Guidelines.
- D. On October 11, 1990, the Board of the BRA adopted a new master plan ("Master Plan") for the Yard's End portion of the Charlestown Navy Yard.
- E. In order to permit implementation of the Yard's End Master Plan in accordance with the terms of the MOA, it is the desire of the Parties to amend the Design Guidelines as set forth herein.

NOW THEREFORE, in consideration of the mutual covenants and agreements herein contained, the Parties agree to amend the Design Guidelines as follows:

1. Definitions. For the purposes of this Amendment and the MOA, the following terms and phrases have the meanings ascribed:

"Building Height" shall mean, excluding mechanical roof structures, penthouses, masts, spires, roof structures, and other structures normally built above the roof and not used or designed to be used for human occupancy, (a) for a flat roof, the vertical distance from the grade to the top of the highest point of the roof beams and (b) for a pitched roof, the vertical distance from grade to the lower of (i) the mean level of the highest gable or of the slope of a hip roof or (ii) the top of the structure of the highest occupied floor. For Piers, grade shall be measured from the top of the deck of the Pier.

"Design Guidelines": Those certain design guidelines identified in paragraph B above.

"Master Plan": That certain Master Plan identified in Paragraph D above.

"New Parcels": Those certain parcels identified as "4A," "4B," "5," "6," and "7" on Exhibit A, attached hereto and incorporated herein.

"Permitted Use(s)": The principal or predominant use(s) of a site. The designation of a Permitted Use or Uses shall not be deemed to exclude accessory and incidental uses.

2. Subsection II(c)(2) of Part 2 of the Design Guidelines, which subsection is entitled "New Construction" is amended by adding the following new paragraph (d):

(d) **ROOFTOP MECHANICAL EQUIPMENT:** Mechanical equipment can enhance the industrial character of the Navy Yard by adhering the following four guidelines:

- (i) Separation: Equipment should be desegregated wherever possible and not connected together in a single mass.
- (ii) Design: The location and composition of the equipment must minimize its visual impact on the surrounding areas.
- (iii) Unscreened: Large screens should be avoided; the scale and irregularity of the equipment should be allowed to be seen.
- (iv) Setback: Mechanical equipment must be located sufficiently back from the parapet to minimize its visibility from pedestrian right-of-ways immediately adjacent to the structure.

3. The parcel controls for Parcel 1B, set forth in Part 3 of the Design Guidelines are amended as follows:

(a) in subsection 3(b), entitled "Height," by deleting the phrase "2 1/2 stories or 35 feet" and inserting in lieu thereof "55' except that within 35 feet of the seaward end of the pier there shall be a no-build area."

(b) in subsection 3(c), entitled "Parking," by inserting before the period at the end of the sentence the following:

"consistent with the Yard's End Master Plan"

(c) in subsection 3(d), by inserting, after the word "consistent," the following:

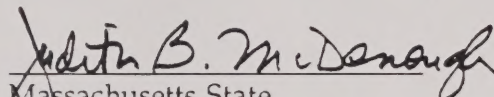
"with the Yard's End Master Plan and"

4. With respect to Parcels 4A, 4B, 5, 6, and 7, the parcel controls set forth in Part 3 of the Design Guidelines are hereby rescinded and the parcel controls set forth in Exhibit B for the corresponding New Parcels are substituted in lieu thereof. For parcels other than said Parcels 4A, 4B, 5, 6, and 7, the parcel controls set forth in said Part 3 remain applicable, except as modified in Sections 2 and 3 above.

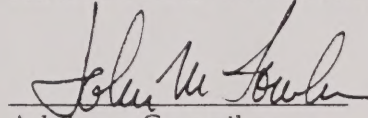
5. This agreement constitutes an approval under M.G.L. C. 9 sec. 26-27C as amended (950 CMR 71.00) of the Amended Design Guidelines on proposed developments on Parcels 1B, 4A, 4B, 6 and 7, subject only to design review which will not reduce the density or height of any development permitted by operation of the design restrictions.

6. Except as expressly modified hereby, the provisions of the Design Guidelines are hereby ratified and confirmed.

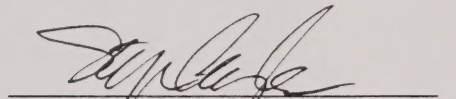
IN WITNESS WHEREOF, the parties have executed this Amendment as of the day and date first above written.



Massachusetts State
Historic Preservation Officer



Advisory Council on
Historic Preservation



Boston Redevelopment Authority

Attachments

- Exhibit A - Plan Showing New Parcels
- Exhibit B - Design Guidelines for New Parcels

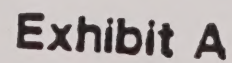


Exhibit A

EXHIBIT B
DESIGN GUIDELINES FOR NEW PARCELS

1. SITE DATA

A. LOCATION

Between Thirtieth and Twenty-Ninth Streets, First Avenue and the river.

B. ZONE

Light Industrial (LI-1)

C. EXISTING DEVELOPMENT

None

2. PERMITTED USE

Manufacturing, processing, assembly, distribution, warehousing, parking, loading and unloading.

3. PARCEL DESIGN

A. HEIGHT

The maximum building height of new construction shall not exceed 35 feet, except that within 50 feet of another property boundary of Parcel 24, the maximum building height shall not exceed 40 feet.

B. ACCESS

Vehicular access to the site shall be via First Avenue and an easement to Sidewalk Street.

C. PARKING

Sufficient parking shall be provided to satisfy the demand generated by the proposed use, consistent with the Yard's Port Master Plan.

D. PUBLIC ACCESS

Continuous public pedestrian access shall be provided along the river water's edge.

E. MATERIALS

New construction shall be concrete, masonry, metal and glass.

New Parcel 4A

1. SITE DATA

A. LOCATION:

Between Thirteenth and Sixteenth Streets, First Avenue and the water.

B. PARCEL:

Approximately 2.3 acres of land.

C. EXISTING STRUCTURES:

None.

2. PERMITTED USES

Hotel, conference center, residential, office, retail, restaurant, parking, marina and marina amenities.

3. PARCEL CONTROLS

A. HEIGHT:

The maximum building height of new construction shall not exceed 135 feet, except that within 50 feet of southwesterly boundary of New Parcel 4A, the maximum building height shall not exceed 90 feet.

B. ACCESS:

Vehicular access to the site shall be via First Avenue and an extension of Sixteenth Street.

C. PARKING:

Sufficient parking shall be provided to satisfy the demand generated by the proposed uses, consistent with the Yard's End Master Plan.

D. PUBLIC ACCESS:

Continuous public pedestrian access shall be provided along the entire water's edge.

E. MATERIALS:

New construction shall be concrete, masonry, metal and glass.

New Parcel 4B

1. SITE DATA

A. LOCATION:

Pier 9.

B. PARCEL AREA:

Approximately 1 acres of pier, and 3.1 acres of water.

C. EXISTING STRUCTURES:

Pier Nine was constructed with wood piles and wood deck.

2. PERMITTED USES

Marina and marina amenities.

3. PARCEL CONTROLS

A. EXISTING STRUCTURES:

Pier Nine may be demolished.

New Parcel 5

1. SITE DATA

A. LOCATION:

Dry Dock Five, Pier Eleven and Pier 10 area.

B. PARCEL AREA:

Approximately 1.8 acres of land, 2.1 acres of pier, 1.4 acres of dry dock and 1.2 acres of water.

C. EXISTING STRUCTURES:

Dry Dock Five was constructed in 1942 of concrete with steel sheeting.

Pier Eleven was constructed in 1956 with end-bearing concrete filled steel pipe piles and a concrete deck.

Pier Ten was constructed with wood piles and wood deck.

Building 226 is a one-story structure with steel frame, masonry walls and steel industrial sash.

2. PERMITTED USES

Aquarium/Cultural, hotel, residential, restaurant, retail, office, research & development, marina, marina amenities, and parking.

3. PARCEL CONTROLS

A. EXISTING STRUCTURES:

Dry Dock Five shall be retained, repaired and remain flooded, or covered and used in a manner consistent with Aquarium uses.

Pier Eleven shall be retained.

Building 226 may be demolished.

B. HEIGHT:

The maximum building height of new construction shall be 110 feet.

C. PARKING:

Sufficient parking shall be provided to satisfy the demand generated by the proposed uses, consistent with the Yard's End Master Plan.

D. PUBLIC ACCESS:

Continuous public pedestrian access shall be provided along the entire water's edge.

E. MATERIALS:

New construction shall be concrete, masonry, metal and glass.

F. ACCESS:

Vehicular access shall be via an extension of Sixteenth Street and an extension of First Avenue.

New Parcel 6

1. SITE DATA

A. LOCATION:

East of Sixteenth Street, between First and Second Avenues.

B. PARCEL AREA:

Approximately 1.5 acres of land and 0.3 acres of pier.

C. EXISTING STRUCTURES:

Building 131 is a three-story concrete and brick masonry structure.

Building 206 is a two-story wood frame building constructed in 1942 as an office.

Building 225 is one-story concrete and masonry building.

2. PERMITTED USES

Research and development, light manufacturing, office, restaurant, retail, parking.

3. PARCEL CONTROLS

A. EXISTING STRUCTURES:

All existing structures may be demolished.

B. HEIGHT:

The permitted height of new construction shall be 110 feet. Any further change in height of new construction, or portions thereof, on Parcel 6 shall be jointly determined by the BRA, the Massachusetts SHPO, and the ACHP.

There shall be a 60-foot no build area on Parcel 6 bordering Sixteenth Street. The no build area will serve to mitigate height next to the Historic Monument Area.

C. PARKING:

Sufficient parking shall be provided to satisfy the demand generated by the proposed uses, consistent with the Yard's End Master Plan.

D. PUBLIC ACCESS:

Continuous public pedestrian access shall be provided along the entire water's edge. Vehicular access shall be via Sixteenth Street and an extension of First Avenue.

E. MATERIALS:

New construction shall be concrete, masonry, metal, and glass.

F. ACCESS:

Vehicular access shall be via Sixteenth Street and an extension of First Avenue.

New Parcel 7

1. SITE DATA

A. LOCATION:

East of Sixteenth Street between Second Avenue and Building 114.

B. PARCEL AREA:

Approximately 3.5 acres of land.

C. EXISTING STRUCTURES:

Building 178 is a one-story frame wood storage shed.

Building 193 is a two-story concrete and brick masonry scrap salvage building.

Building 203 is a two-story incinerator with steel and concrete frame and clad with sheet metal.

Building 227 is a one-story gas storage shed.

Building 165 is a two-story concrete and brick masonry structure.

2. PERMITTED USES

Research and development, light manufacturing, office, restaurant, retail, and parking.

3. PARCEL CONTROLS

A. EXISTING STRUCTURES:

All existing structures may be demolished.

B. HEIGHT:

The maximum Building Height of new construction shall be 155 feet, except that Building 1, a component of the proposed Research Center referenced in the Notice of Project Change on the Charlestown Navy Yard Redevelopment (EOEA File No. 2383) received by the Secretary of the Executive Office of Environmental Affairs on October 31, 1990, shall be limited to a Building Height of 140 feet.

C. PARKING:

Parking shall be provided to satisfy the demand generated by the proposed uses, consistent with the Yard's End Master Plan.

D. PUBLIC ACCESS:

Continuous public pedestrian access shall be provided along the entire water's edge.

E. ACCESS:

Vehicular access shall be via Sixteenth Street and an extension of First Avenue. There is no obligation to create a new street by extending Second Avenue into Parcel 7.

F. MATERIALS:

New construction shall be constructed of materials which are compatible with those of adjoining existing or proposed structures.

